



DEVILBISS® 5-LITER COMPACT OXYGEN CONCENTRATOR

SERVICE MANUAL



DANGER – NO SMOKING



For Product
Numbers:

525DS

525KS

CAUTION-Federal (U.S.A.) law restricts this device
to sale by or on the order of a physician.

TABLE OF CONTENTS

GENERAL INFORMATION

Introduction.....	3
Important Safeguards	3
Safety Precautions and General Warnings.....	3

UNPACKING AND SETUP

Initial Inspection.....	4
Patient Setup	4
Operating Instructions.....	5

MAINTENANCE

Patient Alert System.....	6
Routine Patient Maintenance.....	6
Periodic Homecare Provider Preventative Maintenance.....	7
Between Patient Maintenance.....	7
Preventative Maintenance Summary.....	7

TROUBLESHOOTING

System Operation	8
Normal Operating Sequence	8
Simplified Troubleshooting	9
Troubleshooting Chart A.....	10
Troubleshooting Chart B.....	11
Troubleshooting Chart C.....	11
Troubleshooting Chart D	11
Troubleshooting Chart E	12
Troubleshooting Chart F	12

COMPONENT TESTING, REPAIR, AND REPLACEMENT

Proper Repair Procedures.....	13
Cabinet Removal	14
Accumulator Pressure Test	14
Capacitor.....	14
Compressor	15
Cooling Fan	16
Final Check Valve	16
Flow Meter.....	16
Hour Meter	16
Molecular Sieve Beds	17
Power Cord.....	17
Power Switch	17
Pressure Regulator	17
Printed Circuit Board (PC Board).....	18
Rotary Valve.....	18
Sieve Bed Check Valves	18

FIGURES, DIAGRAMS, AND VIEWS

Figure Index.....	19
Exterior Views.....	20
Interior Views.....	23
Other Figures.....	34
Pneumatic and Wiring Diagrams	37

WARRANTY INFORMATION

Ordering Information	40
Parts Return and Ordering Policy.....	40
Parts List.....	41

SPECIFICATIONS.....	43
---------------------	----

INTRODUCTION

This service manual was designed to provide DeVilbiss Healthcare qualified service technicians and homecare providers with the proper maintenance, service, safety, and repair procedures for the DeVilbiss Oxygen Concentrator.

Read and understand all the information contained in this service manual before attempting to operate or perform any maintenance on the concentrator.

An oxygen concentrator is a device that delivers highly concentrated oxygen for therapeutic applications.

Room air is a mixture of 78% nitrogen, 21% oxygen, 1% argon and other gases. The concentrator draws in room air, separates the nitrogen from the oxygen, and delivers concentrated oxygen to the patient through an oxygen port.

For more in-depth classroom type training, DeVilbiss holds oxygen concentrator service schools. For service school information, contact the Respiratory Technical Service Department at 1-800-338-1988 (814-443-4881).

NOTE—DeVilbiss reserves the right to alter or change the design of the DeVilbiss Oxygen Concentrator series. Hence, slight differences in construction or components may exist between the unit in hand and what is described in this manual.

IMPORTANT SAFEGUARDS

Read all instructions before operating the oxygen concentrator. Important information is highlighted by these terms:

WARNING: Safety information for hazards that might cause serious injury or death.



CAUTION—Information for preventing damage to the product.

NOTE—Information to which you should pay special attention.

DANGER
NO SMOKING

SAFETY PRECAUTIONS AND GENERAL WARNINGS

- A. **CAUTION**—Federal (U.S.A.) law restricts this device to sale by or on the order of a physician.
- B. **WARNING:** Oxygen promotes rapid burning. Do not smoke when using this unit or when near a person receiving oxygen therapy. Do not operate the oxygen concentrator within a minimum of five feet (1.6m) from hot, sparking, or burning objects or naked flames. Do not use in rooms heated by paraffin or portable gas heaters.
- C. Do not place a humidifier with an oxygen patient unless prescribed by a physician and then only a bubble-type humidifier should be used.
- D. Do not connect the oxygen concentrator to an electrical outlet controlled by a wall switch; the outlet should be independent of other appliances.
- E. Do not use an electrical adapter or extension cord with the oxygen concentrator.
- F. Only operate the oxygen concentrator with all filters in place; do not operate if the air filter is wet.
- G. **WARNING:** Electric shock hazard. Do not remove cabinet. The cabinet should only be removed by a qualified DeVilbiss homecare provider.
- H. **WARNING:** Disconnect the power cord from the wall outlet before attempting repairs on the unit. Extra care should be taken if it is necessary to operate the unit with the cabinet removed.
- I. **WARNING:** Do not use oils, greases, or any petroleum-based solvents/cleaners on or near the unit. Use only materials that are compatible with oxygen.
- J. **WARNING:** Electric Shock Hazard. When replacing the capacitor, do not touch the terminals or allow metal objects to come in contact with the terminals on the capacitor. The capacitor may hold a charge for several days after the unit is turned off. The capacitor is located in the base of the unit next to the cooling fan.
- K. Use only DeVilbiss concentrator replacement parts and accessories.
- L. Do not use regenerated sieve material.

INITIAL INSPECTION

It is suggested that an initial inspection be performed upon receiving the oxygen concentrator.

1. After removing the DeVilbiss Oxygen Concentrator from the carton, examine it for any external damage. If shipping damage has occurred, contact the DeVilbiss Customer Service Department at 1-800-338-1988 (814-443-4881) for specific instructions. Save the carton for possible later return; note the position of the unit and placement of the packing material.
2. Open the filter door and record the number of hours on the hour meter. Check to make sure the air filter is in place.
3. Check to be sure the intake bacteria filter is in place.
4. Plug the unit into an electrical outlet, turn the unit "On," and check the audible and visible alerts.
5. Set the flow meter to maximum recommended liter flow and let the unit run for at least 20 minutes.
6. Use an oxygen analyzer to check the concentration.

NOTE—If the unit fails to operate properly (oxygen concentration not within specification) or if internal damage is found, contact the DeVilbiss Customer Service Department at 1-800-338-1988 (814-443-4881).

PATIENT SETUP

1. Position the unit near an electrical outlet in the room where the patient spends most of his or her time.
NOTE—Do not connect to an electrical outlet controlled by a wall switch. The outlet should be independent of other appliances.
2. Position the unit at least 6 inches (16 cm) from walls, draperies, or any other objects that might prevent the proper flow of air in and out of the oxygen concentrator.
3. Locate the unit a minimum of 5 feet (1.6 meters) from fireplaces, radiators, heaters, and hot-air registers.

WARNING

Oxygen promotes rapid burning. Do not smoke when using this unit or when near a person receiving oxygen therapy. Do not operate the oxygen concentrator within a minimum of 5 feet (1.6 meters) from hot, sparking, or burning objects or naked flames. Do not use in rooms heated by paraffin or portable gas heaters.

Electric Shock Hazard. Only qualified DeVilbiss Healthcare homecare providers may remove the cabinet.

4. Attach the appropriate oxygen accessories (oxygen tubing or humidifier) to the oxygen outlet port.

NOTE—A maximum of 50 feet (15 meters) of tubing plus 7 feet (2.1 meters) of cannula plus a bubble humidifier is allowed between the concentrator and the patient.

Oxygen Tubing Only Connection

1. Thread the cannula fitting (part #CN100) onto the oxygen outlet port.
2. Attach the 5/32" (4 mm) I.D. oxygen tubing (part #OST07, OST15, OST25, or OST50).

Oxygen Tubing with Humidification Connection

If the physician has prescribed an oxygen humidifier as part of the patient's therapy, follow these steps:

1. Fill the humidifier bottle (part #HUM16) with distilled, demineralized, or boiled water. Do not overfill. (If using a prefill, go to Step 3.)
2. Thread the wing nut located on the top of the humidifier bottle to the oxygen outlet port so that it is suspended. Make sure it is securely tightened.
3. Attach the 5/32" (4 mm) I.D. oxygen tubing (part # OST07, OST15, OST25, or OST50), not to exceed 50 feet (15 meters), directly to the humidifier bottle outlet fitting.

NOTE—For optimum performance, the DeVilbiss Oxygen Concentrator has a preset nominal output pressure of 8.5 psi (58.6 kPa). Use only "bubble-type" humidifiers. Do not use "jet-type" humidifiers.

NOTE—Condensation from the humidifier may occur in longer lengths of tubing or if the tubing is laying on a cold floor.

When ready for operation

1. Attach the nasal cannula, catheter, or face mask to the oxygen tubing (per the manufacturer's directions).
2. Follow the Operating Instructions on the next page.

OPERATING INSTRUCTIONS

1. Remove the power cord completely from the strap. Make sure the power switch is in the "Off" position.
2. **115 Volt Units**—Insert the plug into an electrical outlet. The DeVilbiss Oxygen Concentrator uses a two-prong polarized plug and is double-insulated to protect against electric shock.
- 220/240 Volt Units**—Ensure it is connected to the unit before inserting plug into an appropriate electrical outlet.

WARNING

The plug on the DeVilbiss 525DS concentrators has one blade wider than the other. To reduce the risk of electric shock, this plug is intended to fit in a wall outlet only one way. Do not attempt to defeat this safety feature.

Improper use of the power cord and plugs can cause a burn, fire, or other electric shock hazards. Do not use the unit if the power cord is damaged.

Oxygen promotes rapid burning. Do not smoke when using this unit or when near a person receiving oxygen therapy. Do not operate the oxygen concentrator within a minimum of five feet (1.6m) from hot, sparking, or burning objects or naked flames. Do not use in rooms heated by paraffin or portable gas heaters.

3. Press the power switch to the "On" position. When the unit is turned "On," all four indicator lights (Power, Service Required, Low Oxygen, and Normal Oxygen) on the front panel will briefly illuminate and an audible signal will sound (the patient alert system) momentarily. After a few seconds, only the "Power" and "Normal Oxygen" lights will remain on.
4. Slowly turn the flow meter knob until the flow meter ball is centered on the line next to the appropriate flow rate.

NOTE—When the flow meter knob is turned clockwise, the flow decreases (and eventually will shut off the oxygen flow). When the knob is turned counter-clockwise, the flow increases.

NOTE—Use low output flow meter (part #515LF-607) for flow rates under 1 lpm.

NOTE—The unit may require up to 20 minutes for the oxygen concentration and flow rate to stabilize. The flow rate should be monitored and readjusted if necessary.

5. The flow meter has a locking device. If it is necessary to preset and lock in the prescribed flow rate, tighten the set screw located on the hex nut just below the control knob using a 1/16" Allen bit. No adjustment can be made without loosening the set screw.
6. The DeVilbiss oxygen concentrator is now ready for use.

PATIENT ALERT SYSTEM

The DeVilbiss Oxygen Concentrator patient alert system will detect unit component failure. This system is comprised of both visible and audible alerts which signal the patient if a malfunction should occur.

DeVilbiss OSD® Operation

The OSD is a device within DeVilbiss concentrators that monitors the oxygen produced by the unit. The OSD operates as follows:

- Normal Oxygen (green light) - oxygen purity normal
- Low Oxygen (yellow light) - oxygen purity low—requires servicing

NOTE—If the oxygen purity continues to fall, an audible signal will sound intermittently. If the oxygen purity continues to fall to a low enough level, the yellow "Low Oxygen" light will turn off and the red "Service Required" light will turn on.

NOTE—Refer to Specifications for specific alert settings.

NOTE—After Power On, the OSD conducts a continuous diagnostic evaluation to check for a fault in the piezo electronics. If this condition is detected by the OSD electronics at any time during concentrator operation, the green "Normal Oxygen" OSD light will turn off and the beeping audible alert and blinking red "Service Required" light activate. Otherwise for the first fifteen minutes of operation, the green "Normal Oxygen" light will remain illuminated during the oxygen stabilization process. After that time, the OSD will begin monitoring the oxygen purity every second.

Alerts:

The visible alert located on the front panel reads "Service Required." The audible alert system is internally powered; no batteries are required. When the indicator lights illuminate or the audible alert sounds, other than during unit start-up, a problem has occurred.

- Power Failure (Blinking red "Service Required" light and pulsing audible alert)
- Low Flow (Below 0.5 lpm) (Continuous red "Service Required" light and audible alert)
- Below Normal Oxygen (84% to 75%, yellow "Low Oxygen" light. 75% to 60%, yellow "Low Oxygen" light and beeping audible alert. Less than 60%, red "Service Required" light and beeping audible alert.) Refer to Specifications for specific alert settings.

The visible and audible alerts will activate for approximately 15 minutes in a no power situation. If the unit is turned "On" without power or power is removed later, no alert will sound for the first 10 seconds. After that time, the alert will produce an audible pulse every few seconds while the visible alert blinks. Power for this alert is provided by a capacitor on the PC board.

NOTE—If the concentrator has been unused for an extended period, the unit must run several minutes before the power fail alert will activate.

The PC (printed circuit) board (Figure 5) is responsible for controlling the system and alerts.

NOTE—A high pressure condition is indicated by the audible (a "popping" sound) release of pressure from a pressure relief valve located on the compressor head.

ROUTINE PATIENT MAINTENANCE

The oxygen patient should perform the following maintenance:

Oxygen Humidifier (reusable bottles only)

The patient should clean the humidifier bottle daily. The patient should follow the instructions supplied by the manufacturer. If no cleaning instructions were supplied, these steps should be followed:

1. Wash the humidifier bottle in a solution of hot water and dishwashing detergent.
2. Soak the humidifier in a solution of one part white vinegar to three parts hot water for 30-45 minutes. This solution acts as a germicidal agent.
3. Rinse thoroughly with hot tap water and refill with distilled, demineralized, or boiled water for use. Do not overfill.

Cannula/Mask and Tubing

The patient should clean and replace the cannula or mask and tubing as instructed by the manufacturer.

Air Filter and Oxygen Outlet Connector

The air filter and oxygen outlet connector should be cleaned at least once a week by the patient. To clean, these steps should be followed:

1. Remove the air filter located in the door on the back of the unit. Remove the oxygen outlet connector (if used) from oxygen outlet port.
2. Wash in a solution of warm water and dishwashing detergent.
3. Rinse thoroughly with warm tap water and towel dry. The filter should be completely dry before reinstalling.

WARNING

Do not attempt to operate the unit without the air filter or while the filter is still damp.

NOTE—The air filter should be monitored more closely in environments with abnormal amounts of dust and lint.

CAUTION—Operation of the DeVilbiss Oxygen Concentrator in extreme environments or without the air filter will prematurely occlude the intake bacteria filter and cause a decrease in the unit performance.

Exterior Cabinet

The patient should clean the concentrator exterior cabinet by using a damp cloth or sponge with a mild household cleaner and wiping it dry.

WARNING

Do not apply liquids directly to the cabinet or utilize any petroleum-based solvents or cleaning agents.

PERIODIC HOMECARE PROVIDER PREVENTATIVE MAINTENANCE

Every DeVilbiss Oxygen Concentrator is tested at the factory. To assure continued trouble-free performance, the following preventative maintenance should be performed by the homecare provider during periodic oxygen patient visits. Failure to properly maintain the unit will void the warranty.

1. Check the oxygen concentration with an oxygen analyzer (part #O2ANA)—every two years.
 - a. Calibrate the oxygen analyzer prior to checking the oxygen concentration. The analyzer should be properly calibrated using the manufacturer's recommended procedure.

NOTE—*Changes in temperature, altitude, or humidity may affect the analyzer's oxygen concentration reading. The analyzer should be calibrated in similar conditions to the location of the concentrator.*
 - b. Set the flow meter to 5 LPM. The concentrator must operate for a minimum of 20 minutes before checking the oxygen concentration.
 - c. Connect the analyzer to the unit's oxygen outlet port and wait until the display stabilizes.
 - d. Record the reading.
2. Check the audible alert and indicator lights every two years. When the power switch is turned "On," listen for the audible alert and check to see if the front panel indicator lights are operating.
3. Inspect intake filter (part #MC44D-605) every 2 years. Replace as necessary.
 - a. Open the filter door and replace filter as required.
4. Inspect the final bacteria filter (part #PV5LD-651) every 3 years. Replace as necessary or in conjunction with compressor service.
 - a. Unplug the unit, remove the cabinet, and loosen the bib.
 - b. Remove the hose from each end of the filter and discard the filter.
 - c. Install the new final bacteria filter with the "IN" fitting toward the flow meter.
 - d. Tighten the bib and replace the cabinet.
5. Inspect the compressor filter (part #525D-622) every 5 years. Replace as necessary or in conjunction with compressor service.

NOTE—*This PM Schedule reflects:*

- 5000 hour usage equal to one year
- a normal, clean operating environment.

The homecare provider is responsible for:

- determining the condition of the concentrator operating environment.
- determining a preventative maintenance interval frequency* which takes into consideration the specific operating environment.

* Standard intervals are noted below. Service interval may be more or less frequent than stated below provided that the Home Care Provider establishes and documents appropriate protocols.

BETWEEN PATIENT MAINTENANCE

1. Discard oxygen tubing, cannula & humidifier bottle.
2. Wash or replace the cabinet air filter.
3. Wash the concentrator cabinet.
4. Check oxygen concentration. If the unit falls within specification, the extended life intake bacteria filter does not need to be replaced between patients.

PREVENTATIVE MAINTENANCE SUMMARY

Patient

Daily Clean the humidifier bottle (if used).

Weekly Clean air filter on back of unit.
Clean exterior of cabinet.

Other Clean and replace cannula/mask and tubing as instructed by manufacturer.

Homecare Provider

2 years Inspect/Replace intake bacteria filter as necessary.

- Check audible alert and indicator lights.
- Check oxygen concentration.
- Wash/Replace cabinet filter.

3 years Inspect/Replace final bacteria filter.

5 years Inspect/Replace the compressor filter.

SYSTEM OPERATION

The DeVilbiss Oxygen Concentrator uses a pressure swing adsorption system. The air is drawn into the unit through air filters and into a double-head compressor.

A pneumatic diagram of the system is shown in Figure 17.

The compressed air passes through a rotary valve (Figure 5), which is cycled at a pre-determined rate, and is directed into one of two sieve beds. The sieve beds contain molecular sieve material which is a synthetically-produced inorganic silicate. It is very porous and has the unique ability to selectively adsorb nitrogen from the air as it passes through the sieve bed.

As one bed is being pressurized, the other bed is quickly depressurized. This allows the nitrogen that was adsorbed during its pressurization cycle to be exhausted from the sieve material.

The nitrogen is released through exhaust ports located on the rotary valve assembly. The ports are connected to a single piece of hose running from the valve to the exhaust muffler.

Also during each bed pressurization, a small amount of oxygen flows through an orifice (Figure 6) from the pressurized bed into the depressurizing bed. The orifice is clamped inside a long piece of blue tubing connecting the outlets of the two sieve beds. This helps purge the nitrogen from the depressurizing bed.

The beds will continue to be alternately pressurized and depressurized as the unit operates.

Oxygen leaving the sieve beds is directed through a check valve to the accumulator tank. A pressure regulator (Figure 9) on the tank controls the oxygen pressure as it leaves the accumulator and enters the flow meter. The flow meter allows the oxygen flow to be controlled and adjusted to the level prescribed by the patient's physician. From the flow meter the oxygen passes through the final bacteria filter (Figure 10), a check valve, and finally the oxygen outlet port to the patient.

The DeVilbiss Oxygen Concentrator operates on a timed cycle. The cycling is controlled by the PC board. The PC board will send voltage to the valve causing it to shift and alternately pressurize the sieve beds.

The PC board also activates the electronic alert system. A high pressure condition will be indicated with a "popping" type sound produced by release of pressure from a pressure relief valve on the compressor head. Low flow, system abnormality, and power failure are indicated by audible and visible alerts.

The 525 Model operating system incorporates "turn-down" technology. The PC board constantly monitors the flow rate and will decrease the cycle time whenever the flow rate is less than 2.5 LPM. Therefore it "turns-down" the cycle based on lower oxygen demand. As a result, the unit runs cooler and less power is consumed.

NORMAL OPERATING SEQUENCE

When the concentrator is turned "On," the following cycling sequence can be observed by attaching pressure gauges to the sieve bed test points.

1. The rotary valve is quickly cycled several times to relieve residual bed pressure preventing a static condition in the compressor. This rapid cycling only happens on start-up and is clearly heard as pressure is being quickly exhausted several times through the exhaust muffler that is connected to the valve.
2. The PC board applies a short DC voltage signal to the valve. The valve will stop for several seconds causing the right bed to pressurize first while the left bed depressurizes to approximately 2 PSI (14 kPa).
3. Voltage is again applied to the valve for a short time. The valve will stop for approximately a second. During this time the sieve bed pressures are equalized.
4. A short DC voltage signal is again applied to the valve. The valve will stop for several seconds causing the left bed to pressurize while the right bed depressurizes to approximately 2 PSI (14 kPa).
5. A short DC voltage signal is again applied to the valve. The valve will stop for approximately a second. During this time, the sieve bed pressures are equalized.
6. The cycle then repeats with step 2.

NOTE—In the "turn-down" mode, the fixed cycle time is decreased to a few seconds and the bed pressure equalization time to less than a second.

NOTE—High-end sieve bed pressure should not exceed 1/2 PSI (4 kPa) above high-end accumulator pressures. Refer to Specifications for normal pressures obtained during the cycle.

SIMPLIFIED TROUBLESHOOTING

The key to simple troubleshooting is to recognize which type of problem exists and select the most effective approach to solving the problem. The different types of problems and the approaches for solutions are as follows:

Type I—The unit runs but a low pressure and flow or high pressure condition exists.

NOTE—Low pressure or flow are indicated by both a visible and audible alarm. High pressure is indicated by a “popping” sound caused by the pressure relief valve.

1. Connect test gauges to sieve bed tests points (Figure 9).
2. Refer to the Normal Operating Sequence to make sure the unit is cycling properly.
3. If bed pressure is rising slowly, check for occluded filters and severe leaks. If filters are clean and there are no leaks, then the compressor is defective.
4. If the pressure relief valve is releasing pressure, observe whether the unit is cycling or not.
5. If the unit is not cycling or has uneven bed pressures, this indicates that the rotary valve is not operating correctly. Refer to the Rotary Valve Testing described in the chapter Component Testing, Repair and Replacement.
6. If the unit is cycling in conjunction with very high bed pressures, this indicates defective sieve beds.

Type II—The compressor will not start when the unit is turned on.

1. Verify that the cooling fan is running; if it is not, determine where you are losing power.
2. Check for compressor voltage at the compressor connector.
3. If voltage is present, then the capacitor or compressor is defective.
4. If voltage is not present, the wire harness is defective.

WARNING

Electric Shock Hazard. Extra care should be taken if it is necessary to operate the unit with the cabinet removed.

WARNING

Mechanical Hazard. Keep fingers, loose clothing, etc. away when working on compressor.

Type III—The concentrator runs and continues to cycle but has low oxygen concentrations.

1. Connect test gauges and check for higher or lower than normal bed pressures.
 - a. High pressures indicate defective sieve beds.
 - b. Low pressures indicate occluded filters, leaks, or defective compressor.
 - c. Uneven bed pressures indicate valve is not operating correctly.
2. Check for oxygen leaks at:
 - sieve beds
 - flow meter
 - accumulator tank
 - final bacteria filter
 - pressure regulator
 - final check valve
 - outlet port

NOTE—Check for leaks using a certified leak detection solution such as Snoop® or equivalent (must not contain ethylene glycol). Apply leak test solution to all fittings and hose connections with unit running. If an air leak is present, the solution will bubble. All leaks should be repaired before putting the unit back in service.

CAUTION—Do not apply leak test solution to any part of the rotary valve or the main PC Board assembly.

3. Test accumulator tank pressure. If pressure is lower than normal, then sieve bed check valves are defective.

NOTE—For normal system pressures refer to Specifications.

TROUBLESHOOTING

TROUBLESHOOTING CHART A

Visible Alarm	Audible Alarm	Compressor	Power Light
OFF	OFF	ON	ON
Other Symptoms	Possible Cause	Possible Remedy	
Pulsating air noise	Intake filter not in place or defective Compressor intake hose disconnected	Check filter and replace if necessary Reconnect hose	
Excessive noise	Loose or defective motor mounts Defective compressor Defective cooling fan	Replace motor mounts Replace compressor Replace cooling fan	
Fluctuating oxygen flow	Occluded humidifier Use of improper humidifier Occluded filters Occluded or defective cannula and tubing Use of excess oxygen tubing Defective flow meter Leak in system Defective compressor Defective compressor reed valve Defective check valve Pressure regulator not adjusted properly or defective	Clean or replace humidifier Use only a bubble-type humidifier Clean or replace filters Detach cannula from oxygen delivery tubing. If proper flow is not attained, check tubing for kinks or other obstructions. Clean or straighten as required or replace tubing if necessary. The unit is designed to deliver 5 lpm with a cannula on 50 feet (15 meters) of approximately 5/32" (4 mm) inside diameter tubing. Smaller diameter tubing or the addition of any other flow restriction may prevent obtaining the desired flow rate. Replace flow meter Check for leaks in all hoses and fittings Replace compressor Replace compressor reed valve Replace check valve Adjust or replace pressure regulator	
Little or no oxygen flow	Flow meter not adjusted properly Hose disconnected to flow meter Oxygen delivery tubing is kinked or blocked Occluded humidifier	Adjust flow meter Reconnect hose Straighten tubing or remove obstruction Clean or replace humidifier	
Low oxygen concentration	Leak in system Defective sieve bed check valve Defective compressor reed valve Defective compressor Rotary valve not operating correctly Occluded filters Contaminated sieve beds	Check for leaks in all hoses and fittings Replace check valve Replace compressor reed valve Replace compressor Replace valve Clean or replace filters Replace sieve beds	
Audible alarm does not sound during power failure	Unit has not been used for an extended period of time. NOTE —If the concentrator has been unused for an extended period, the unit must run several minutes before the power fail alarm will activate. Defective PC board Defective power switch Defective wire harness	Allow unit to run for 20 minutes and retry Replace PC board Replace power switch Replace wire harness	
Audible alarm does not sound when unit is turned "On"	Defective PC board	Replace PC board	
Pressure relief valve activated - "popping" sound	PC board connectors not properly latched Defective PC board Defective rotary valve	Be sure tabs are pushed completely into place Replace PC board Replace valve	
Service Required light does not illuminate when unit is turned "On"	PC board connectors not properly latched Defective PC board Defective light	Be sure tabs are pushed completely into place Replace PC board Replace light	

TROUBLESHOOTING

TROUBLESHOOTING CHART B

Visible Alarm	Audible Alarm	Compressor	Power Light
Blinking	Pulsing	OFF	OFF
Other Symptoms	Possible Cause	Possible Remedy	
Fan off	Line cord not properly installed or defective	Insert plug in receptacle or replace line cord. On 220/240 Volt units, check that the IEC connector on the back of the unit is attached.	
	No power at receptacle	Check building circuit breaker or fuse, or have house wiring checked by qualified electrician. Circuit may be fully loaded with other appliances and another receptacle may be required. Wall outlet should be independent of other appliances.	
	Oxygen concentrator circuit breaker activated	Press the circuit breaker reset button. If unit circuit breaker opens again, check internal wiring.	
	Line cord quick-connect terminal inside unit is disconnected	Reconnect quick-connect terminal	
	Defective power switch	Replace power switch	
	Defective circuit breaker	Replace circuit breaker	

TROUBLESHOOTING CHART C

Visible Alarm	Audible Alarm	Compressor	Power Light
Blinking	Pulsing	ON	ON/OFF
Other Symptoms	Possible Cause	Possible Remedy	
Fan and compressor operating. Pressure relief valve activated – “popping” sound	Connector on PC board not connected	Connect connector	
	Blown fuse on PC board	Replace fuse	
	Defective PC board	Replace PC board	

TROUBLESHOOTING CHART D

Visible Alarm	Audible Alarm	Compressor	Power Light
ON	ON	OFF	ON
Other Symptoms	Possible Cause	Possible Remedy	
Fan operating	Main wiring harness disconnected/defective	Reconnect/replace wiring harness	
	Loose compressor wire	Tighten or attach wire	
	Defective capacitor	Replace capacitor	
	Defective compressor	Replace compressor	
Unit warm to the touch and cannot be restarted for several minutes	Compressor overheated due to:		
	1. Occluded filters	1. Clean or replace filters	
	2. Restricted input or output air passage	2. Remove obstruction	
	3. Low or high line voltage	3. Check line voltage; use alternate circuit independent of other appliances	
Defective cooling fan	Defective cooling fan	Replace cooling fan	
	Defective compressor	Replace compressor	

TROUBLESHOOTING

TROUBLESHOOTING CHART E

Visible Alarm	Audible Alarm	Compressor	Power Light
ON	ON	ON	ON
Other Symptoms		Possible Cause	
Fluctuating or no flow		System pressure below 9 psi (62.1 kPa) due to: 1. Leak in system 2. Defective compressor	
		I. Check for leaks in all hoses and fittings Replace compressor	

TROUBLESHOOTING CHART F

Visible Alarm	Audible Alarm	Compressor	Power Light
See below	See below	ON	ON
Other Symptoms		Possible Cause	
No OSD lights are illuminated.		Defective OSD.	
		Check concentration with an oxygen analyzer. If the concentration is within specification, replace the PC board.	
No OSD lights are illuminated, but red "Service Required" light is illuminated accompanied by a beeping audible alarm.		Oxygen level is low*	
		Check concentration with an oxygen analyzer If the concentration is within specification, replace the PC board. If the concentration is low, refer to low oxygen concentration symptom in Troubleshooting Chart A.	
Both OSD lights are illuminated.		Defective OSD	
		Replace PC board.	
Yellow Low Oxygen light is illuminated.		Oxygen level is low*	
		Check concentration with an oxygen analyzer If the concentration is within specification, replace the PC board. If the concentration is low, refer to low oxygen concentration symptom in Troubleshooting Chart A.	
Yellow Low Oxygen light is illuminated and an intermittent audible alarm sounds every few seconds.		Oxygen level is low*	
		Check concentration with an oxygen analyzer If the concentration is within specification, replace the PC board. If the concentration is low, refer to low oxygen concentration symptom in Troubleshooting Chart A.	

*Refer to Specifications page for oxygen purity levels.

PROPER REPAIR PROCEDURES

The DeVilbiss Oxygen Concentrator is designed for ease of service. To aid service personnel, a Service Kit (part #444-501) is available which contains the necessary gauges, tools, and testing instruments to properly service the oxygen concentrator. On parts that are sold separately, the part number is indicated in parenthesis.

The following parts are included in the Service Kit:

I	Slotted bit	I	5/32" Allen bit	I	AC/DC test light
I	#1 Phillips bit	I	5/64" Allen bit	I	1/4" Ratchet wrench
I	#2 Phillips kit	I	9/64" Allen bit	I	3mm Hexbit
I	7/16" Socket 1/4" Drive	I	7/64" Allen bit	I	T-15 Torx "L" wrench
I	Crescent wrench	2	Pressure/Vacuum gauge (part #PVO2D-601)	I	10mm Socket 1/4" Drive
I	8" Duckbill pliers	I	Tool box	I	1/4" Drive extension
I	T-10 Bit	2	Test Fittings (part #303DZ-637)	I	Plastic storage case
		I	Torx screwdriver w/bits	I	Plastic error indicator tool

In addition to the Service Kit, an oxygen analyzer (part #O2ANA) is needed to periodically check oxygen concentration levels. A voltmeter will be needed for more accurate voltage testing.

NOTE—Be sure to read all of the steps involved before beginning any of the procedures in this manual.

NOTE—After repairing or replacing a component run the unit for 20 minutes, check the oxygen concentration and test for leaks.

Test for leaks using a certified leak detection solution such as SWAGELOK #MS-Snoop® or equivalent (must not contain ethylene glycol). Apply leak test solution to all fittings and hose connections with the unit running. If an air leak is present, the solution will bubble. All leaks should be repaired before putting the concentrator back in service.

CAUTION—Do not apply leak test solution to any part of the rotary valve or the main PC Board assembly.

WARNING

When servicing the DeVilbiss Oxygen Concentrator, be absolutely certain that the correct tools are used and that the parts are free of oil and grease or any material not compatible with oxygen. Teflon® tape is recommended and must be applied to the male threads omitting the first thread to eliminate the possibility of tape particles entering the oxygen system.

Electric shock hazard. Do not remove cabinet. The cabinet should only be removed by a qualified DeVilbiss homecare provider.

Disconnect the power cord from the wall outlet before attempting repairs on the unit. Extra care should be taken if it is necessary to operate the unit with the cabinet removed.

Teflon® is a registered trademark of DuPont.
Snoop® is a registered trademark of SWAGELOK

CABINET REMOVAL

To remove front and back cabinets (Fig. 3):

1. Ensure the unit is unplugged from the wall outlet.
2. Using a screwdriver, remove the six screws that hold the back cabinet to the internal structure and the bib.
3. Remove the back cabinet by sliding it toward the rear until clear.
4. Remove the front cabinet by pushing the top shoulders toward the back of the unit, then outward away from behind the bib. Tilt the top of the front cabinet forward until it can be pulled out of the base of the unit.
5. To reassemble, reverse steps 2-4.

The majority of all the servicing and repairs can be done without removing the front bib. However, to gain access to the components behind the bib, it may be loosened or removed.

To loosen the bib (Figure 11):

1. Remove the two screws (located directly above the hour meter) that hold the bib to the unit's internal structure. This will allow access to the components behind the bib.

To remove the bib completely (Figure 11):

1. Remove the two screws as above.
2. Disconnect the ribbon connector from the PC board.
3. Disconnect the lines from the power switch and circuit breaker. Mark these wires accordingly.
4. Tilt the top of the bib forward to release it from the slot in the body of the concentrator.
5. Remove the hose connected to the bottom of the flow meter.

To reassemble bib:

1. Reconnect the wires and hose.
2. Insert the bib tab into the slot above the rotary valve, and push until it snaps into place.
3. Secure bib with two screws.

ACCUMULATOR PRESSURE TEST

To check accumulator pressures:

1. Make sure the unit is "Off."
2. Remove front and back cabinets.
3. Use the pressure-vacuum gauge (part #PVO2D-601) and pressure test assembly (part #303DZ-637) included in the Service Kit.
4. Remove the tubing cap from the accumulator tank fitting and attach the 1/16" (1.6 mm) diameter tubing from the gauge to the accumulator tank fitting just vacated above.
5. Turn the unit "On" with the flow rate set to maximum recommended flow.

During each timed cycle, the average pressure in the oxygen accumulator will rise and fall.

NOTE—Normal pressures observed depend on altitude and flow rate.

Increases in altitude and flow rate will slightly decrease accumulator pressures. Decreases in the two variables will slightly increase accumulator pressures. Acceptable accumulator pressure swing ranges at various altitudes at the maximum recommended flow are identified in the Specifications.

NOTE—A defective check valve may cause a rapid drop in accumulator pressure below the minimum value.

NOTE—A defective compressor will be indicated by slowly rising pressure. Pressure may only reach a certain level and then stop.

Low oxygen concentration levels and accumulator pressures higher than normal may indicate defective sieve beds. Severely contaminated beds may also cause the pressure relief valve on the compressor to open.

NOTE—A malfunctioning rotary valve will also cause high accumulator tank pressure and activation of the pressure relief valve. In this case it should be determined whether the problem is with the sieve beds, valve, or both.

CAPACITOR

The capacitor enables the compressor to start and run by supplying voltage to the windings of the compressor motor. A defective capacitor will result in the compressor running slower or not starting.

CAUTION—The 525DS concentrators use a GSE compressor with a 22 mfd capacitor. If replacement is necessary, be sure the correct capacitor is installed.

CAUTION—The 525KS concentrators use a GSE compressor with a 10 mfd capacitor. If replacement is necessary, be sure the correct capacitor is installed.

WARNING

Electric Shock Hazard. When replacing the capacitor, do not touch the terminals or allow metal objects to come in contact with the terminals on the capacitor. The capacitor may hold a charge for several days after the unit is turned off.

If a defective capacitor is suspected, a new one must be installed. The capacitor is strapped into a well molded into the bottom of the unit (Figure 14) next to the cooling fan.

To replace the capacitor:

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets.
3. Remove the compressor.
4. Disconnect the two wires from the terminals on the capacitor.
5. Cut the nylon cable tie holding the capacitor in place and remove the capacitor.
6. Reconnect the wires to the new capacitor.
7. Install the new capacitor and secure with a new cable tie.
8. Replace the compressor.
9. Replace the front and back cabinets and secure with the six screws.

COMPRESSOR

The DeVilbiss Oxygen Concentrator uses a double-head, oil-free compressor. The compressor is secured to the base with four motor mounts.

A compressor that is worn or defective may:

- cause pressure to rise slowly.
- cause excessive noise and/or vibration.
- cause lower oxygen concentrations.

A worn or defective compressor can be caused by a defective internal component such as:

- reed valve
- o -ring
- gasket
- cup seal

These components are included in the Compressor Rebuild Kit (part #525DZ-643).

NOTE—A built-in thermal cutoff switch will shut the compressor off if it becomes overheated. This protects the compressor from damage caused by heat build-up. (Some models have an auxiliary thermostat mounted within the compressor compartment.)

NOTE—A pressure relief (PR) valve is located on the pressure head to prevent high pressure build up in the system should a component malfunction occur.

To test the compressor operating voltage (Fig 11):

The compressor requires line voltage to operate. If the compressor does not start when the unit is turned on, the voltage input must be tested:

1. This voltage can be checked at the compressor connector using a voltmeter or test light connected to the brown and blue wires. The voltmeter is the best way to test.
2. If no voltage is detected, disconnect power and check for loose or broken wires between the compressor connector and switch or wire harness.
3. If there is voltage at the compressor connector, then either the capacitor or the compressor itself is defective.

To test the compressor for proper output:

NOTE—If the compressor is not providing a high enough output the patient alert system may be activated.

1. Remove the front and back cabinets.
2. Connect pressure-vacuum gauges to the sieve bed test points. See the Sieve Bed Pressure Test in the Component Testing, Repair, and Replacement section for details on attaching the gauge. A defective compressor will be indicated by slowly rising pressure. Pressure may only reach a certain level and then stop.

If these conditions are observed then:

- The unit filter(s) may be occluded—check the air filter, compressor filter, and intake filter for occlusions.
- There may be a severe leak in the system—check for air leaks using a leak detection solution such as Snoop® or equivalent (must not contain ethylene glycol).

CAUTION—Do not apply leak test solution to any part of the rotary valve or the main PC Board assembly.

- The compressor reed valves, cup seal, or the compressor itself may be defective.

If the filters are not occluded and no leaks are found, the compressor must then be removed and repaired or replaced.

To remove the compressor:

1. Make sure the unit is unplugged from the wall outlet.
2. Disconnect the compressor wires by disconnecting the compressor electrical connector (Figure 11).
3. Remove the ladder clamp and hose from the exhaust fittings on the compressor head (Figure 12) and compressor filter.
4. Carefully place the concentrator on its front side. From the bottom of the unit, remove the four 10 mm hex nuts that secure the motor mounts.
5. Lift compressor partially out of the compressor housing area and loosen ladder clamp securing hose to the intake fitting, then remove hose.
6. Compressor may now be removed from the compressor housing area.

CAUTION—If the unit has been running recently, the compressor may be hot.

7. Unscrew motor mounts from compressor feet by hand.

To inspect and/or replace internal components (Figs. 15 & 15A):

1. Remove the eight screws that hold the compressor heads in place. When removing the heads, be sure to keep each head and its components with the correct compressor side.
2. Check for proper placement of or damage to the gaskets on the bottom of the compressor heads. Replace if damaged.
3. Remove reed valve plates. A reed valve is located on each side of the valve plate.
4. The compressor reed valves should be flush with the valve plate. If the valve is broken or not flush with the valve plate, or foreign matter is detected inside the head, clean or replace the compressor reed valves.

To replace the compressor reed valves (Fig. 15A):

- a. Remove the screw holding the compressor reed valves in position on the valve plate and discard the used reed valves.
- b. Position the new reed valves so that they are centered and completely cover the holes in the valve plate.
- c. Place the metal retainer on the reed valves and secure with the reed valve screw.
5. Check for proper placement of or damage to the rubber o-ring on the bottom of the valve plate. Replace if damaged.
6. Remove piston sleeves by pulling upward and inspect cup seal on pistons. Replace if badly worn or damaged.

To replace cup seal (Fig. 15A):

- a. Remove rod screw from top of piston.
- b. Remove the cup retainer plate.
- c. Discard defective cup seal.
- d. Place new cup seal into position.
- e. Replace cup retainer plate.
- f. Secure with screws.
7. Reposition sleeve on piston.

NOTE—In some cases, it may be easier to position sleeve on piston before installing a new cup seal and retainer plate.

8. Place valve plates on the compressor so that heads of reed valve screws are aligned with the indentation in top of pistons.
9. Install the compressor heads so that the holes in the heads are aligned with the holes in the compressor housing.
10. Secure compressor heads with the screws.

To replace the compressor:

CAUTION—The 525DS concentrators use a GSE compressor with a 22 mfd capacitor. The 525KS concentrators use a GSE compressor with a 10 mfd capacitor. If replacement is necessary, be sure the correct capacitor is installed.

1. Inspect the motor mounts. Replace if damaged. Attach mounts to compressor feet.
2. Inspect the capacitor to determine if replacement is necessary. If capacitor is wrong value for compressor or replacement is desired, refer to Capacitor section.
3. Reconnect hose to the compressor intake fitting.
4. Position compressor on the base of the unit so that the studs on the motor mounts protrude through the holes in the base of the unit.
5. Secure motor mounts with hex nuts.
6. Reconnect hoses to the fittings at compressor exhaust and filter.
7. Reconnect the compressor electrical connector.

COOLING FAN

The cooling fan provides a constant air flow to cool the compressor. The cooling fan is located in the bottom of the unit below the compressor (Figure 14).

A defective cooling fan may cause the compressor's internal thermo-protective device to activate and shut the compressor off. Should this condition occur, the compressor will require several minutes for the thermo-protective device to reset.

If the cooling fan is defective, it must be replaced:

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets.
3. Remove the compressor.
4. Disconnect the cooling fan terminals.
5. Note the position of the fan and fan guard before removing the four retaining screws that secure the fan to the base of the unit.
6. Remove the defective fan and secure the replacement fan in position with the four retaining screws.

NOTE—When installing the fan, be sure the air flow directional arrow on the side of the fan is directed away from the compressor and fan guard is reinstalled properly.

7. Reconnect the electrical connector.
8. Reinstall the compressor.

FINAL CHECK VALVE

This check valve is located between the final bacteria filter and the oxygen outlet fitting. This check valve allows oxygen to flow only out of the unit. When the unit is turned off and oxygen flow stops, the check valve closes to prevent water from being drawn into the unit.

A defective final check valve may allow water to be drawn in from the humidifier bottle when the unit is turned off. This may occlude the final bacteria filter and/or the flow meter causing a restriction of flow and making it difficult to adjust the flow rate.

To replace the final check valve (Figure 10):

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets and loosen or remove the bib.
3. Remove the hose from the outlet side of the final bacteria filter.
4. Remove the two screws from the back of the oxygen outlet fitting assembly and remove the assembly.
5. Remove the hose from each end of the final check valve.
6. Attach the hoses to a new check valve. Make sure that the flat side of the check valve is directed toward the oxygen outlet fitting.
7. Replace the outlet fitting assembly and connect the hose to the filter.
8. Replace the bib and front and back cabinets.

FLOW METER

The pressure-compensated flow meter has an accuracy level of $\pm 5\%$ at full scale (exception: $+0\%, -5\%$ at 5 lpm). The flow meter on the DeVilbiss Oxygen Concentrator is designed for use at 8.5 psi (58.6 kPa) at flow rates up to 5 lpm.

To check for leaks in the flow meter tubing:

1. Check for leaks using a certified leak detection solution such as Snoop® or equivalent (must not contain ethylene glycol).
2. Apply leak test solution to all fittings and hose connections with the unit running.

CAUTION—Do not apply leak test solution to any part of the rotary valve or the main PC Board assembly.

3. If an air leak is present, the solution will bubble. All leaks should be repaired before putting the concentrator back in service.

WARNING

Electric Shock Hazard. Use caution when leak testing near electrical connections.

To replace the flow meter (Figure 10):

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets.
3. From behind the bib remove the 2 hoses from the flow meter.
4. While squeezing tabs on flow meter brackets, push the flow meter through the bib.
5. Install new flow meter in bib and reconnect hoses.

HOUR METER

To replace the hour meter (Figure 9):

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets and loosen the bib.
3. Disconnect the hour meter connector from the PC board.
4. Remove the meter by carefully inserting a small flat screwdriver under the outer edge of meter and prying upward.
5. Install a new hour meter by applying downward pressure until it snaps into position.
6. Connect the hour meter to the PC board.

CAUTION—Do not apply any force or flex the PC Board when connecting or disconnecting electronic or pneumatic components. Damage to the electronic assembly is possible.

MOLECULAR SIEVE BEDS

The two molecular sieve beds alternately remove the nitrogen from the air passing through them and provide the patient with a constant supply of oxygen.

The efficiency of the molecular sieve material will be impaired if it becomes contaminated by moisture. Contamination causes the molecular sieve material to lose its nitrogen adsorbing properties resulting in a decrease in oxygen concentration. The unit should run for a minimum of 20 minutes before turning "Off" to prevent problems associated with moisture contamination in the system.

To test the sieve beds:

1. Remove the 1/16" plugged piece of tubing from the top of each sieve bed.
2. Connect the pressure-vacuum gauges to the sieve bed test points (Figure 9) in order to observe unit cycling and bed pressures. Refer to the section on Normal Operating Sequence.
3. If it is determined that the valve did not shift, refer to the section on Rotary Valve testing. However, if the unit is cycling properly allow unit to run while observing the sieve bed pressures.
4. After 20 minutes of operation, check the oxygen concentration levels. Low oxygen concentration and high pressures indicate contaminated sieve beds.

NOTE—If the molecular sieve material is found to be no longer effective, first locate the source of the malfunction or cause (such as leaks) for contamination and take corrective action.

To replace the molecular sieve beds (Figs. 5 & 6):

1. Make sure any contamination problem has been corrected before replacing.
2. Make sure the unit is unplugged from the wall outlet.
3. Cut the plastic cable ties that secure the sieve beds to the internal structure of the unit.
4. Remove the tubing from the fittings at the top of each sieve bed.
5. Remove the hose clamps and hose from the bottom of the sieve beds.
6. Install new sieve beds in reverse order using new plastic cable ties. Position the new beds so that the bed serial number label is at the top of the unit.

NOTE—Make sure that the sealing caps remain on the new sieve beds until just prior to connecting hoses and tubing.

7. Leak test all connections with a certified leak detection solution such as Snoop® or equivalent (must not contain ethylene glycol). Apply leak test solution to all fittings and hose connections with unit running. If an air leak is present, the solution will bubble. All leaks should be repaired before putting the unit back in service.

CAUTION—Do not apply leak test solution to any part of the rotary valve or the main PC Board assembly.

POWER CORD

To replace the power cord - 115 volt units only (Fig. 11 & 14):

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the back cabinet.
3. Disconnect the power cord connector.

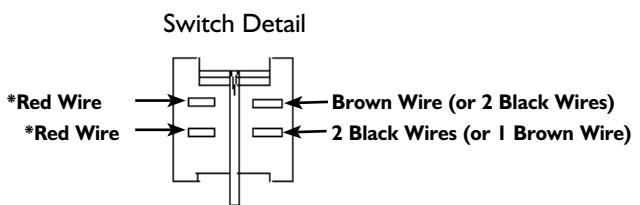
NOTE—Loosening or removing the compressor mounting plate may make it easier to service the power cord.

4. Note wire colors and socket locations before removing wires.
5. Using a pair of duckbill pliers, squeeze the power cord strain relief and pull it out of the base of the unit.
6. Insert a new power cord through the hole in the base of the unit and secure with strain relief.
7. Insert sockets into connector housing and then reconnect the power cord connector.
8. Replace back cabinet and secure with the six screws.

POWER SWITCH

To replace the power switch (Figure 10):

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets and loosen the bib.
3. Note the position of the wires and switch before removing the wires from the switch terminals.
4. While squeezing the locking tabs on the sides of the switch, push the switch out of the front of the bib.
5. Install the new switch in the correct orientation making sure that it locks into position.
6. Reconnect the wires to the switch terminals.



*Either red wire can be connected to either left hand terminal of the switch

PRESSURE REGULATOR

The pressure regulator stabilizes the flow of oxygen to the patient and establishes back pressure on the system. It is preset at 8.5 psi (58.6 kPa) and should not have to be adjusted in the field.

To test the pressure regulator:

1. Turn the unit "On."
2. Set the flow meter at 2 lpm.
3. Use a pressure-vacuum gauge (part #PVO2D-601) and a fitting suitable to fit on the oxygen outlet or on a short piece of tubing connected to the outlet.
4. If the pressure-vacuum gauge reads anything other than $8.5 \pm .5$ psi (58.6 ± 5.9 kPa) with gauge outlet blocked, adjustment to the pressure regulator may be required. If so, call DeVilbiss Service Department at 1-800-338-1988 (814-443-4881).

NOTE—Make sure no leaks exist before adjusting the pressure regulator by using a certified leak detection solution such as Snoop® or equivalent (must not contain ethylene glycol).

CAUTION—Do not apply leak test solution to any part of the rotary valve or the main PC Board assembly.

A malfunction in the pressure regulator will cause either a loss or fluctuation in the oxygen flow which will be seen on the flow meter or a decrease in oxygen concentration.

To replace the pressure regulator (Figure 9):

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets.
3. Remove the tubing clamp and tubing from the pressure regulator.
4. Unscrew the regulator from the accumulator tank.
5. Install a new regulator on the accumulator tank and attach the tubing and tubing clamp.
6. Replace the front and back cabinets.

PRINTED CIRCUIT BOARD

The printed circuit (PC) board is responsible for monitoring and controlling the DeVilbiss Oxygen Concentrator.

The PC board has preset alerts for low flow and power failure. Should any of the alert values be exceeded, the patient alert system will activate.

NOTE—If the concentrator has been unused for an extended period, the unit must run 20 minutes before the power fail alert will be enabled. This alert is powered by a capacitor on the PC board.

CAUTION—Do not apply any force or flex to the PC Board when connecting or disconnecting electronic or pneumatic components. Damage to the electronic assembly is possible.

To remove and replace the PC board (Figs 5 & 7):

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the front and back cabinets and the bib.
3. Disconnect all wires, terminals and connectors.
4. Remove the 1/8" (3.2mm) tubing attached to the sensor.
5. Remove the screw that secures the board to the unit and remove the PC board.
6. Install the new PC board and secure it using the screw.

NOTE—Confirm PC Board is correct; use only 525DS-622 on 525DS units and 525KS-622 on 525KS units..

7. Reconnect all electrical wires, terminals, connectors and the tubing to the sensor.
8. Replace the bib and front and back cabinets.

ROTARY VALVE

The timed rotary valve alternately distributes pressure supplied by the compressor to the sieve beds. While one bed is being pressurized the other bed is being exhausted through the valve. Exhaust gases go through the valve exhaust port and exit through the exhaust muffler.

The valve contains two revolving discs powered by a stepper motor to cycle the pressure between the beds. DC voltage is supplied by the PC board to the motor windings causing the internal discs to turn and direct pressure to the proper sieve bed.

If the rotary valve does not shift properly the same bed may continue to pressurize causing the pressure relief valve to release the excess pressure.

There are several reasons why the rotary valve could malfunction; therefore the cause of failure must be determined before corrective action can be taken.

To test the rotary valve (Figures 9 & 16):

1. Remove the front cabinet.
2. Connect pressure gauges to the test points at the top of the sieve

beds in order to observe unit cycling and bed pressures. Refer to the section on Normal Operating Sequence.

3. If it is determined that the valve did not shift properly or the bed pressures are uneven, continue testing with step 4.
4. The stepper motor on the rotary valve has multiple windings so there are several voltage readings that need to be checked in order to determine if the problem is being caused by the PC board or the valve itself. Testing for proper voltage is done at the wire harness connectors on the valve or on the PC Board using a voltmeter.

Below are the valve voltage test positions and voltages that should be present at each one:

Negative Lead	Positive Lead	Voltage Reading
Orange	Yellow or White	12 VDC
Orange	Gray	5 VDC
Orange	Brown	5 VDC (intermittent)
Black or Green or Red or Blue	Yellow or White	2-3 VDC (intermittent)

NOTE—The 2-3 Volt reading will go on and off as the valve cycles. 525 Series have a fixed cycle time. However, when the concentrator goes into its “turn-down” mode, the cycle time is shortened.

5. If any of these readings are not obtained, check for loose or broken wires in the harness. If wire harness is okay, replace the main PC board.
6. If proper voltages are obtained, replace valve.

To replace the rotary valve:

1. Make sure the unit is unplugged from the wall outlet.
2. Remove the front cabinet and loosen the bib.
3. Unplug valve wire harness from the valve.
4. Loosen speedy clamps and remove bed hoses from each side of valve.
5. Loosen ladder clamps and remove pressure intake and exhaust hoses from backside of valve.
6. Install the new rotary valve by reversing the above procedure.

SIEVE BED CHECK VALVES

A check valve (Figure 6) located between the outlet of each sieve bed and the accumulator tank allows oxygen to pass through the sieve beds to the accumulator tank when the bed pressure is greater than the accumulator tank pressure. These valves also prevent reverse flow of oxygen from the accumulator to the sieve beds.

Run the Accumulator Pressure Test described in the Component Testing, Repair, and Replacement section. It covers details of attaching the gauge. Acceptable pressure swing ranges at various altitudes are included in the Specifications.

A defective check valve will result in a decrease in oxygen concentration and lower accumulator pressures.

To replace a defective check valve, remove the tubing on either side of it and install a new valve making sure the outlet end is toward the accumulator tank.

FIGURES, DIAGRAMS, AND VIEWS INDEX

Exterior Views - The following figures show the exterior of the DeVilbiss 5-Liter Compact Concentrators.

- Figure 1 Front
- Figure 2 Rear
- Figure 3 Side

Interior Views - The following figures show the interior of the DeVilbiss 5-Liter Compact Concentrators.

- Figure 4 Front with Cover Removed
- Figure 5 Front
- Figure 6 Front, Lower, close up
- Figure 7 Front, Upper, close up
- Figure 8 PC Board
- Figure 9 Top
- Figure 10 Behind Bib
- Figure 11 Rear
- Figure 12 Rear, Lower, close up
- Figure 13 Rear, Compressor Housing, close up
- Figure 14 Base

Other Figures

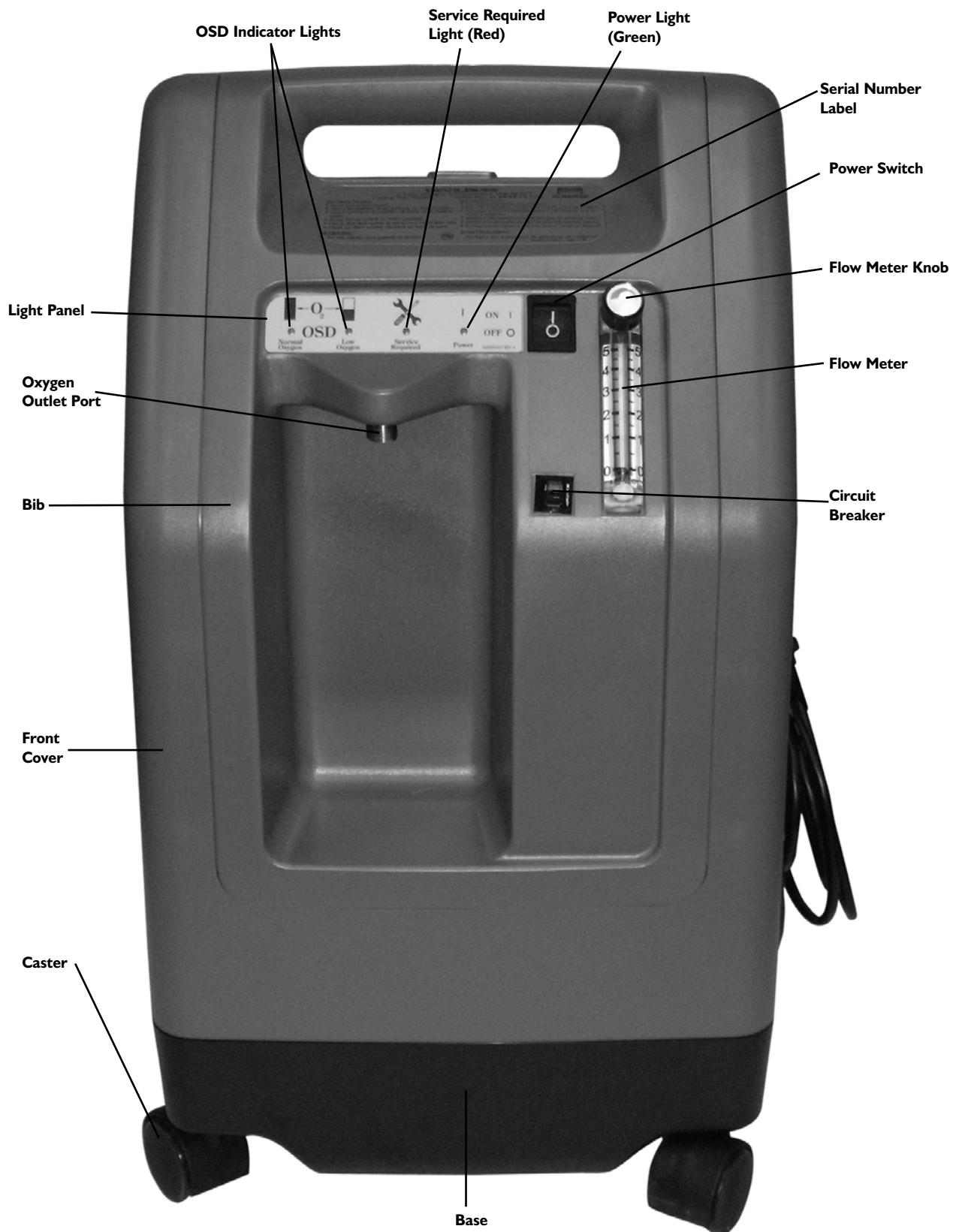
- Figure 15 GSE Compressor (removed from base)
- Figure 15A GSE Compressor (with head removed)
- Figure 16 Rotary Valve

Diagrams

- Figure 17 Pneumatic Diagram
- Figure 18 Wiring Diagram

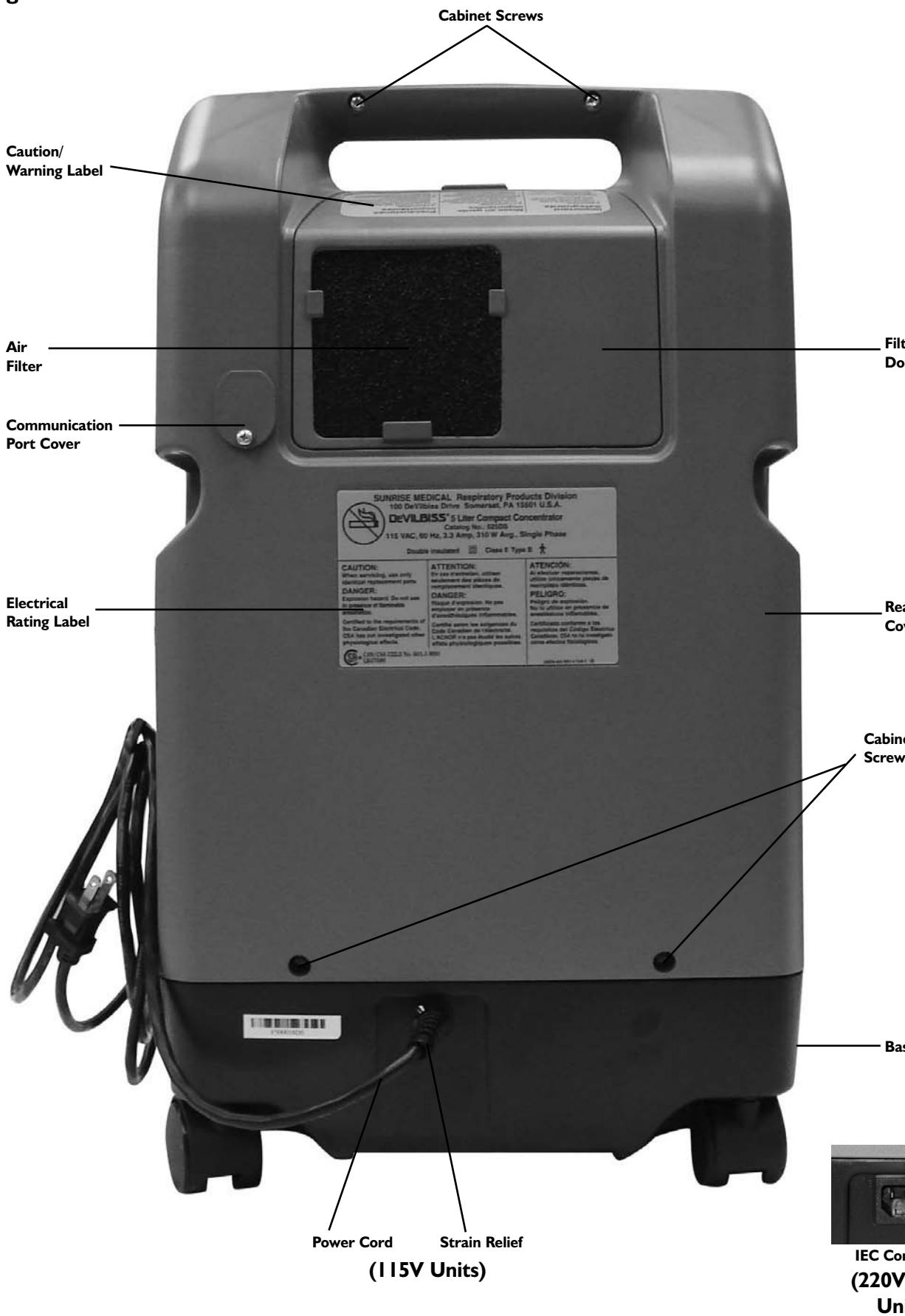
FIGURES, DIAGRAMS, AND VIEWS

Figure I - Exterior Front View



FIGURES, DIAGRAMS, AND VIEWS

Figure 2 - Exterior Rear View



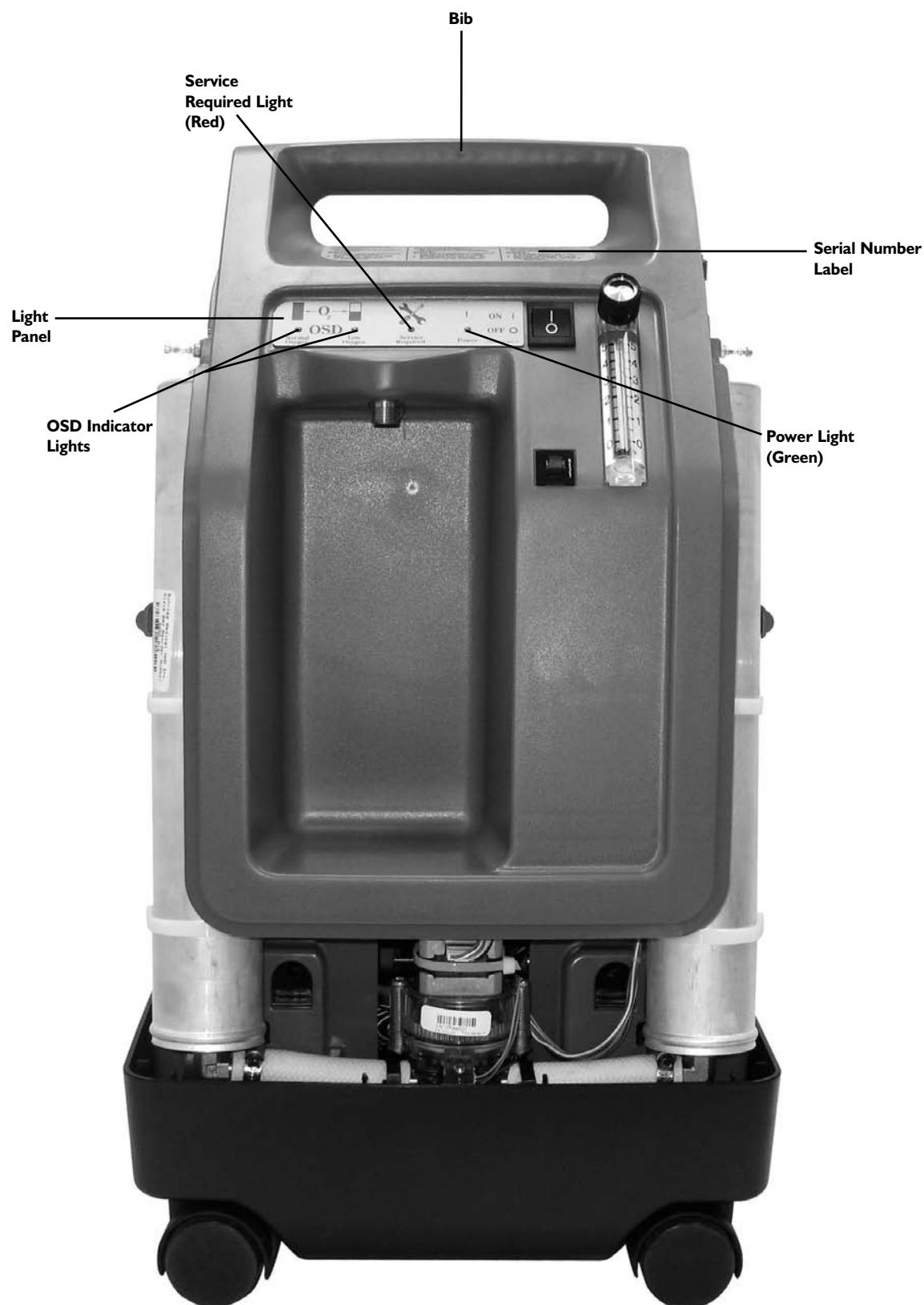
FIGURES, DIAGRAMS, AND VIEWS

Figure 3 - Exterior Side View



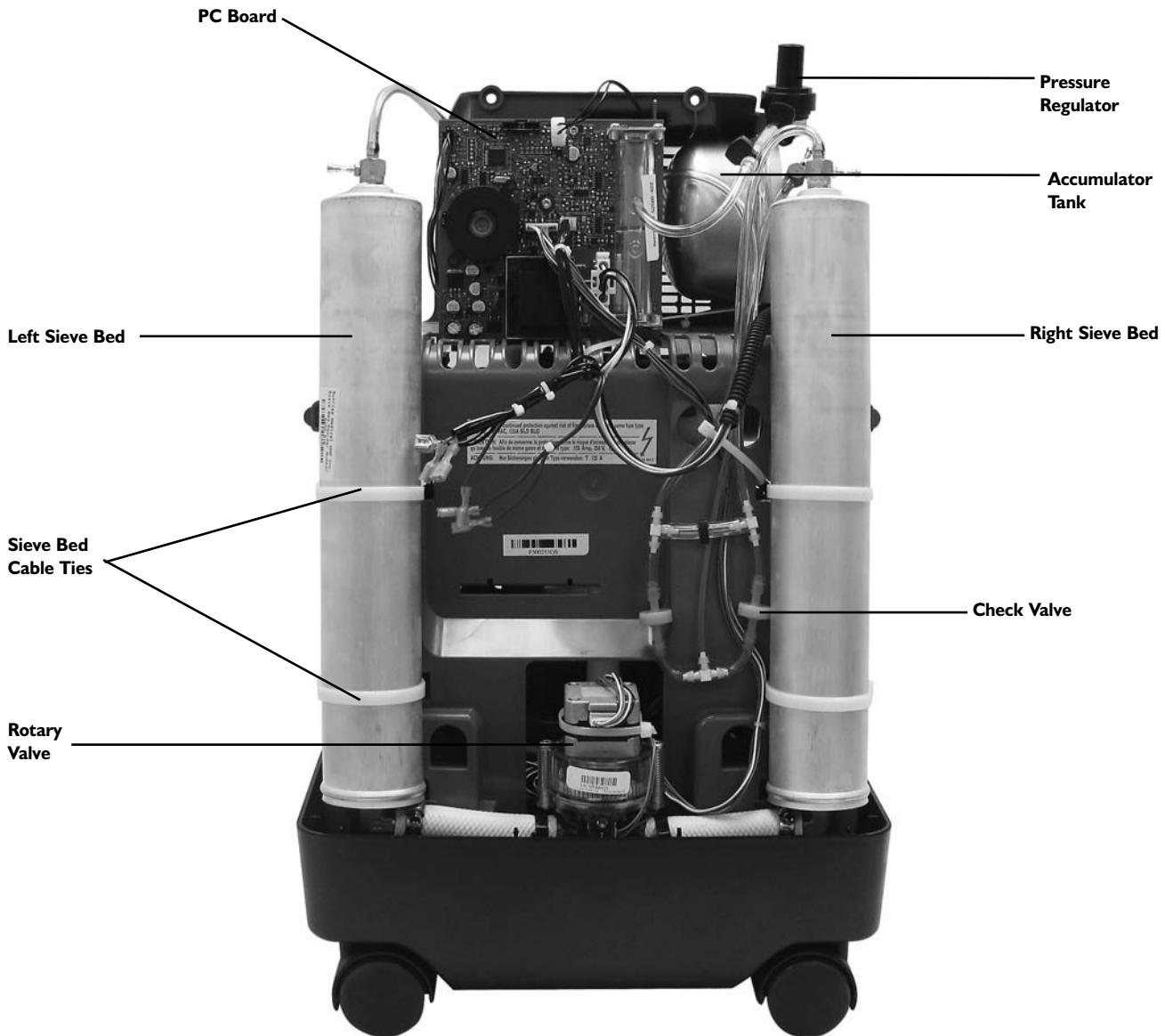
FIGURES, DIAGRAMS, AND VIEWS

Figure 4 - Front with Cover Removed



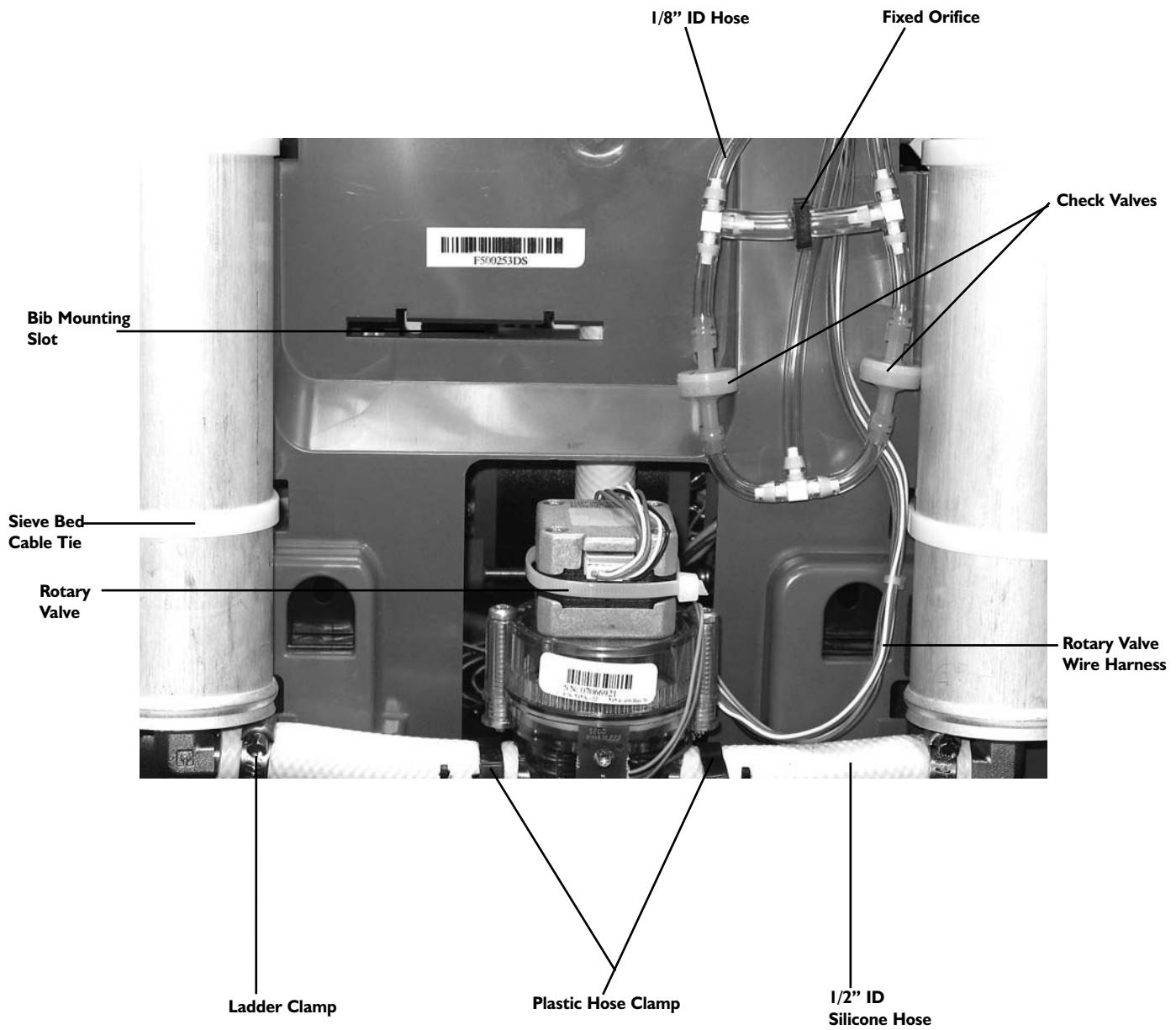
FIGURES, DIAGRAMS, AND VIEWS

Figure 5 - Interior, Front View



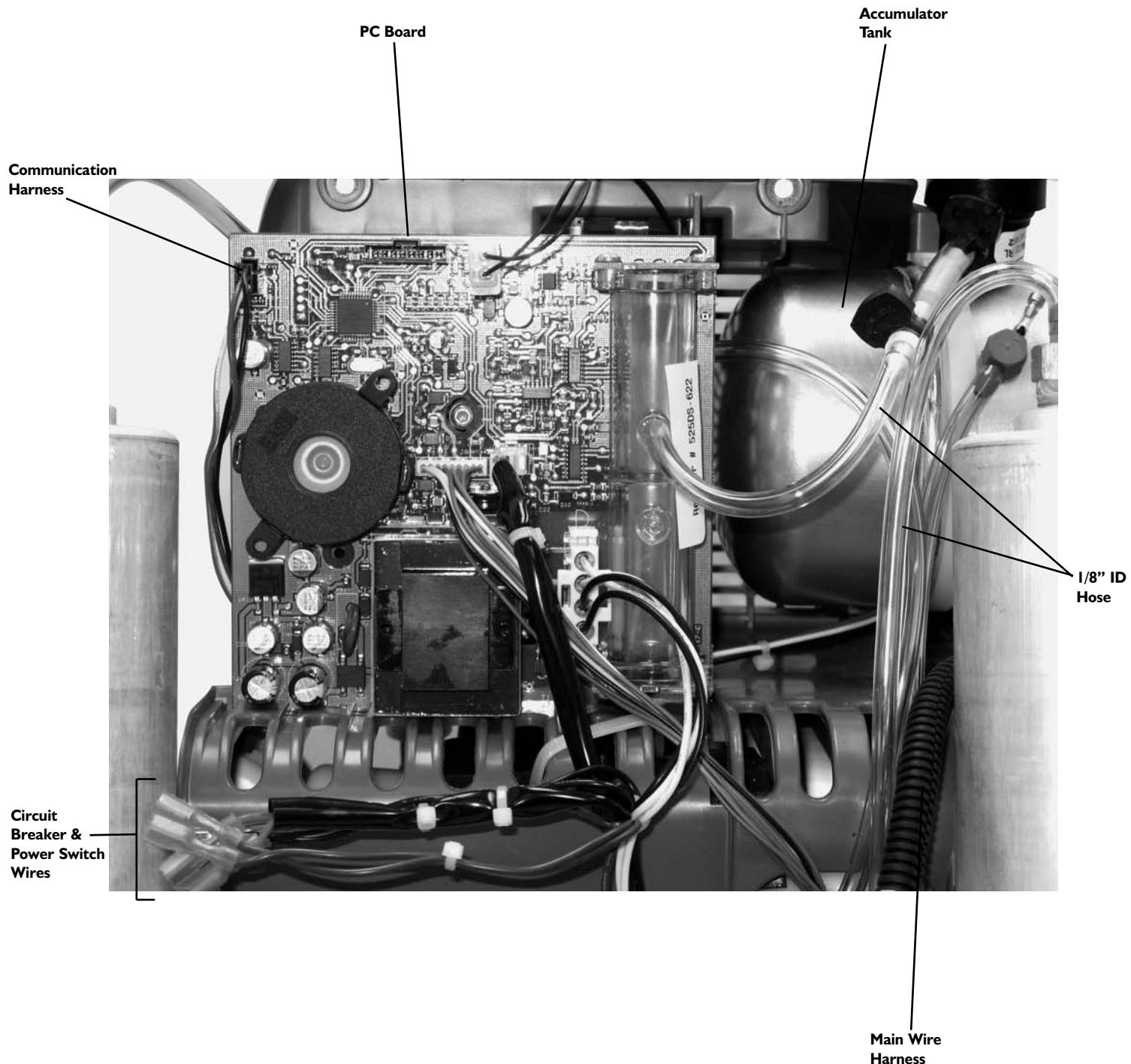
FIGURES, DIAGRAMS, AND VIEWS

Figure 6 - Interior, Front Lower View



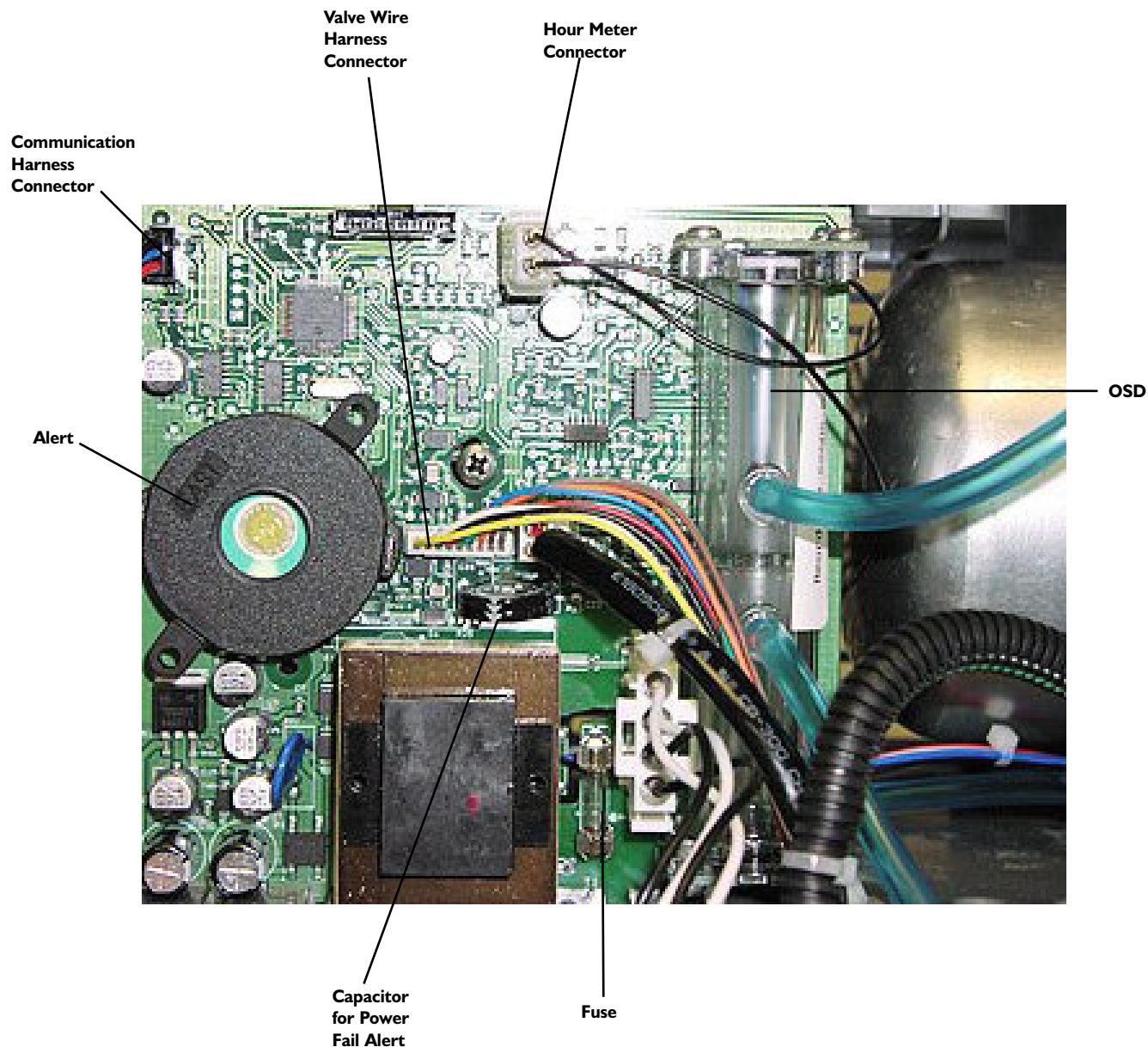
FIGURES, DIAGRAMS, AND VIEWS

Figure 7 - Interior, Front Upper View



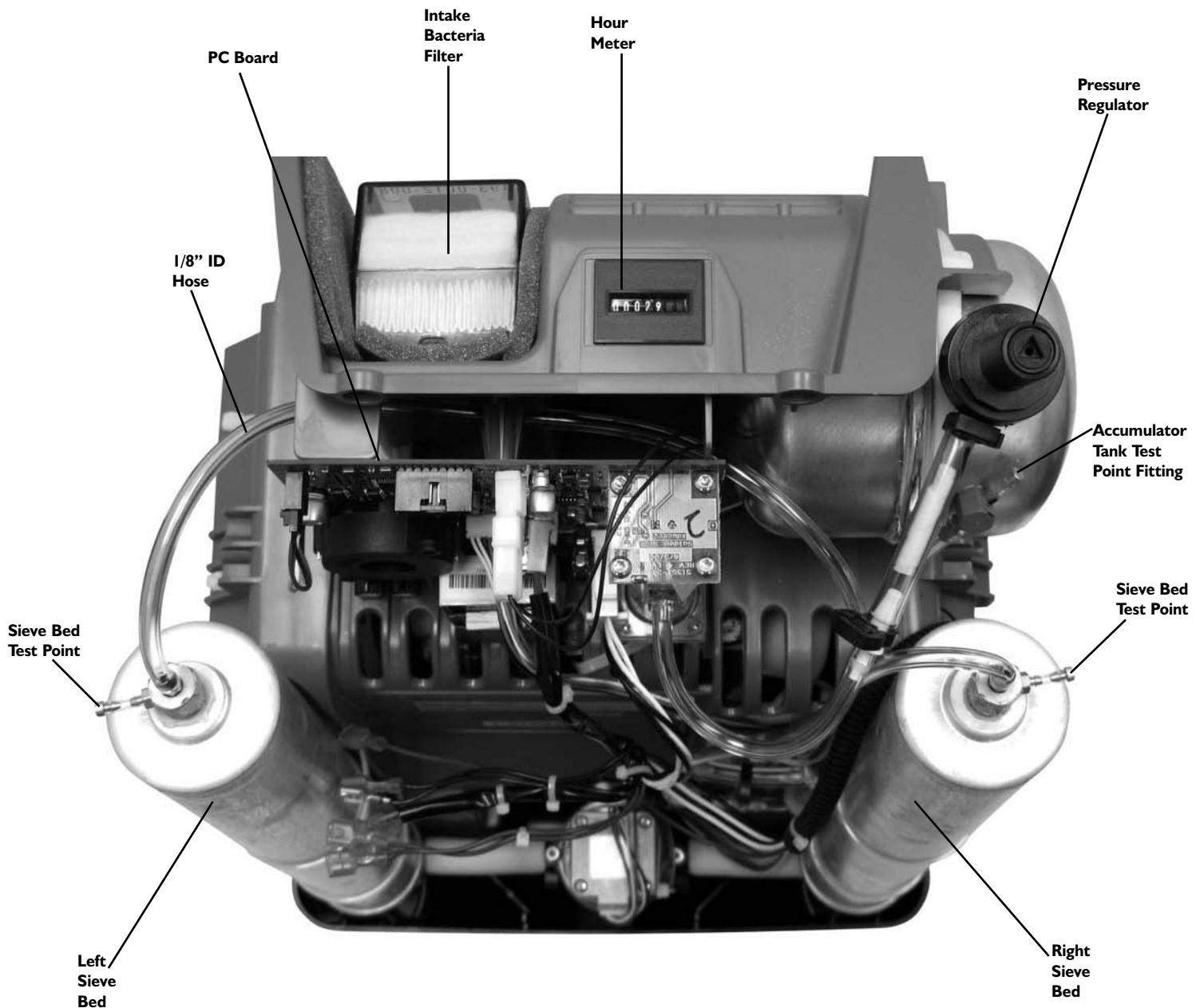
FIGURES, DIAGRAMS, AND VIEWS

Figure 8 - PC Board



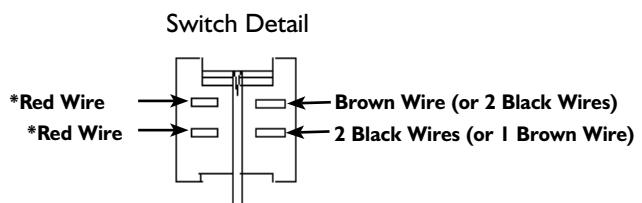
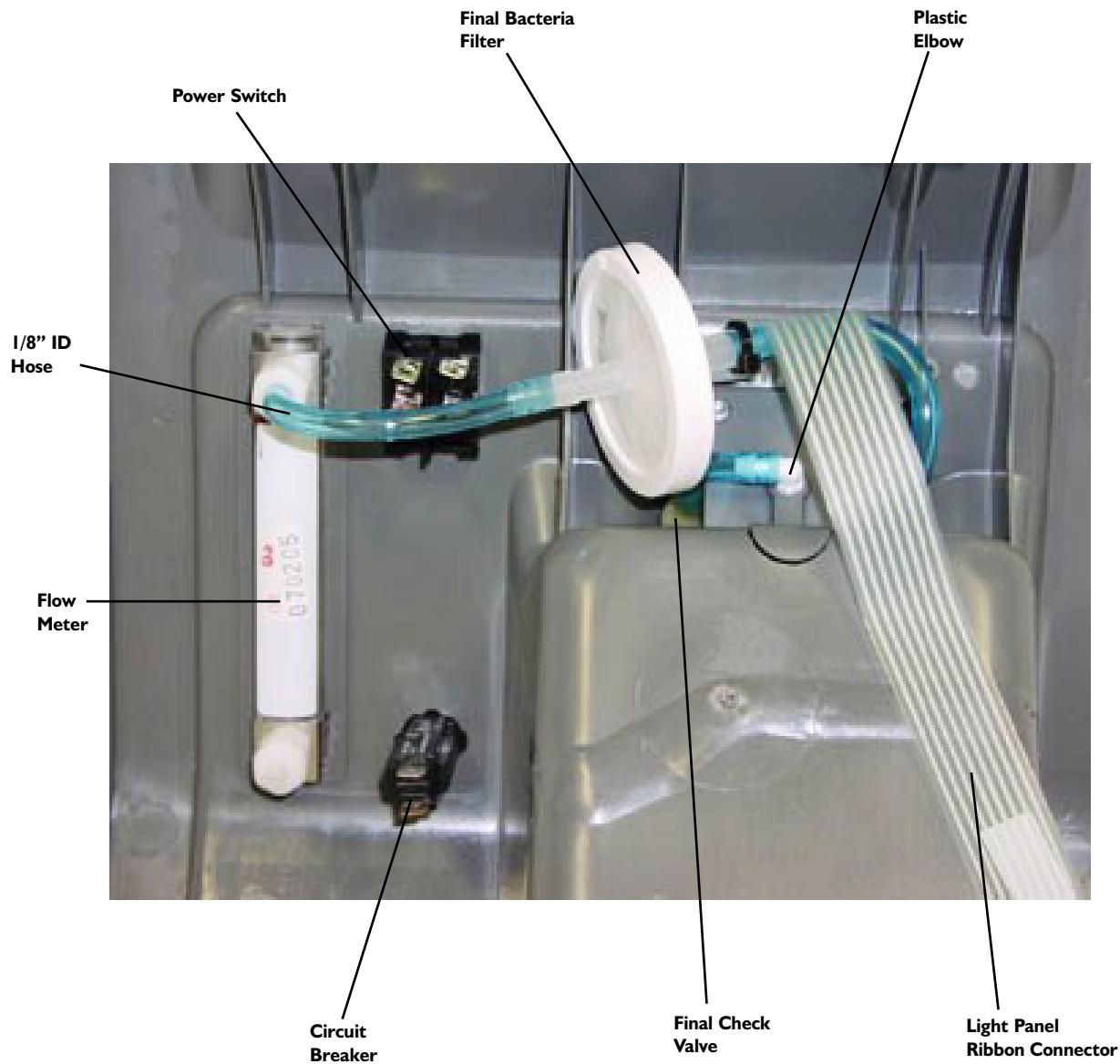
FIGURES, DIAGRAMS, AND VIEWS

Figure 9 - Interior, Top View



FIGURES, DIAGRAMS, AND VIEWS

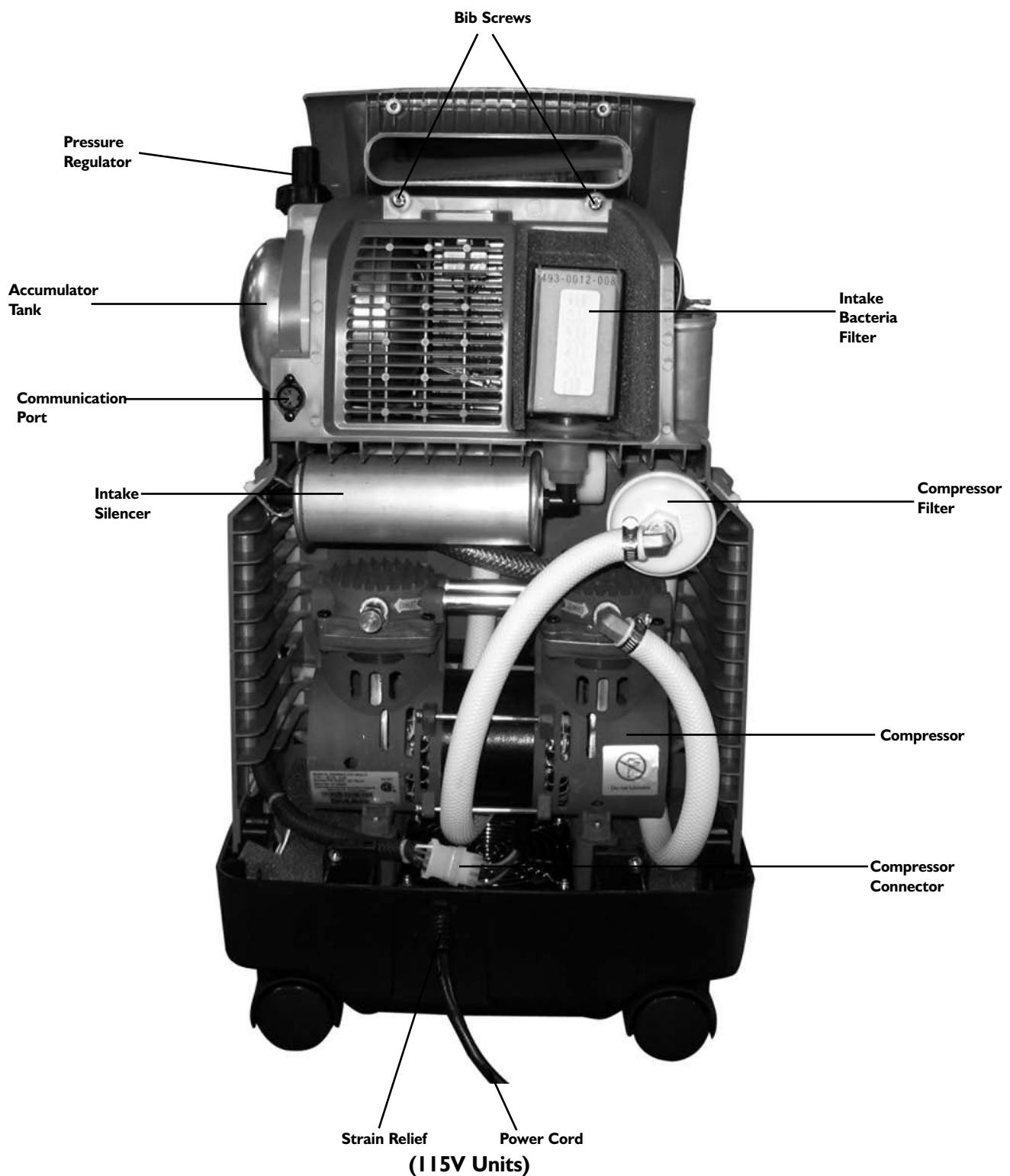
Figure 10 - Interior, Behind Bib



*Either red wire can be connected to either left hand terminal of the switch

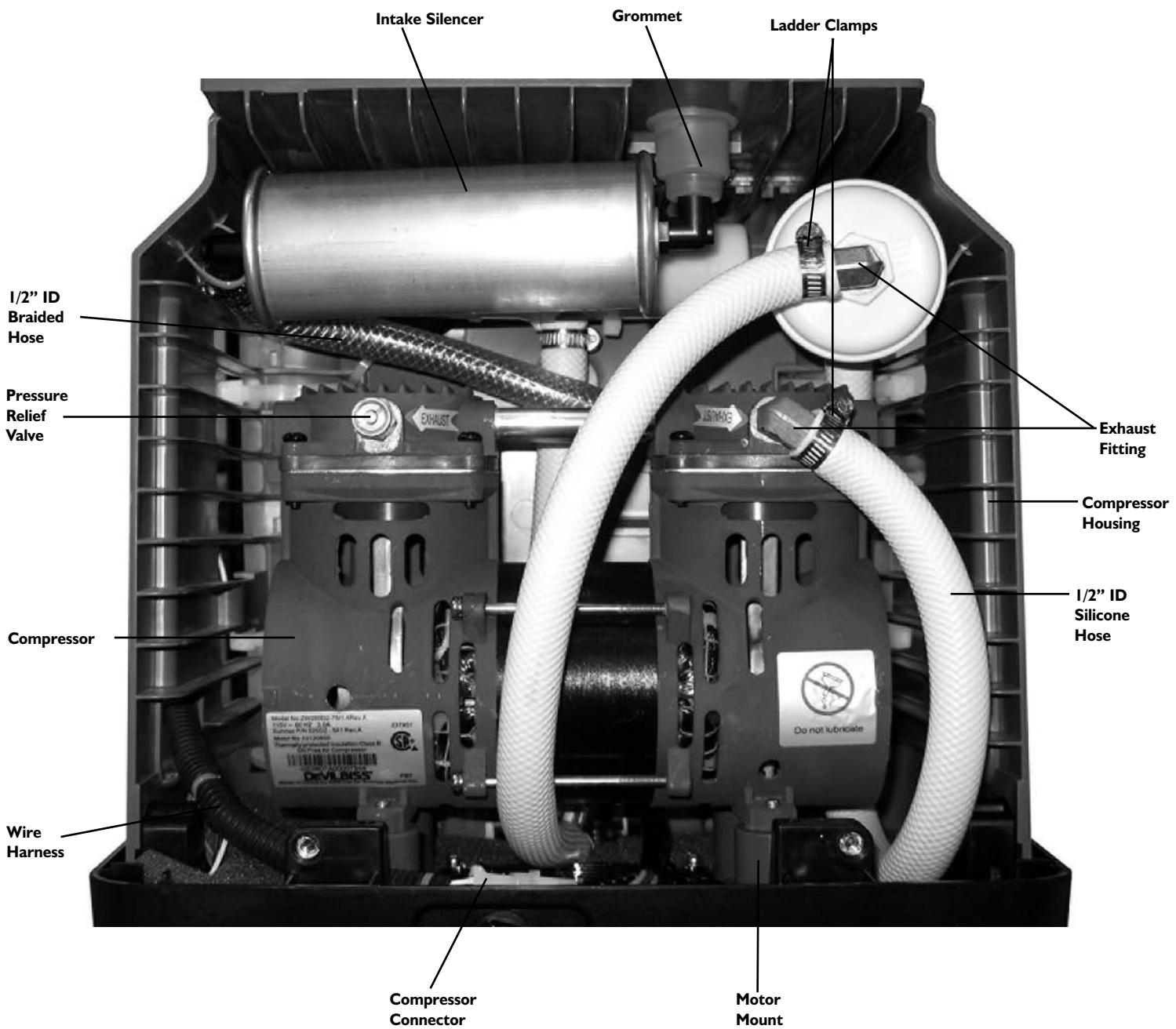
FIGURES, DIAGRAMS, AND VIEWS

Figure 11 - Interior Rear View



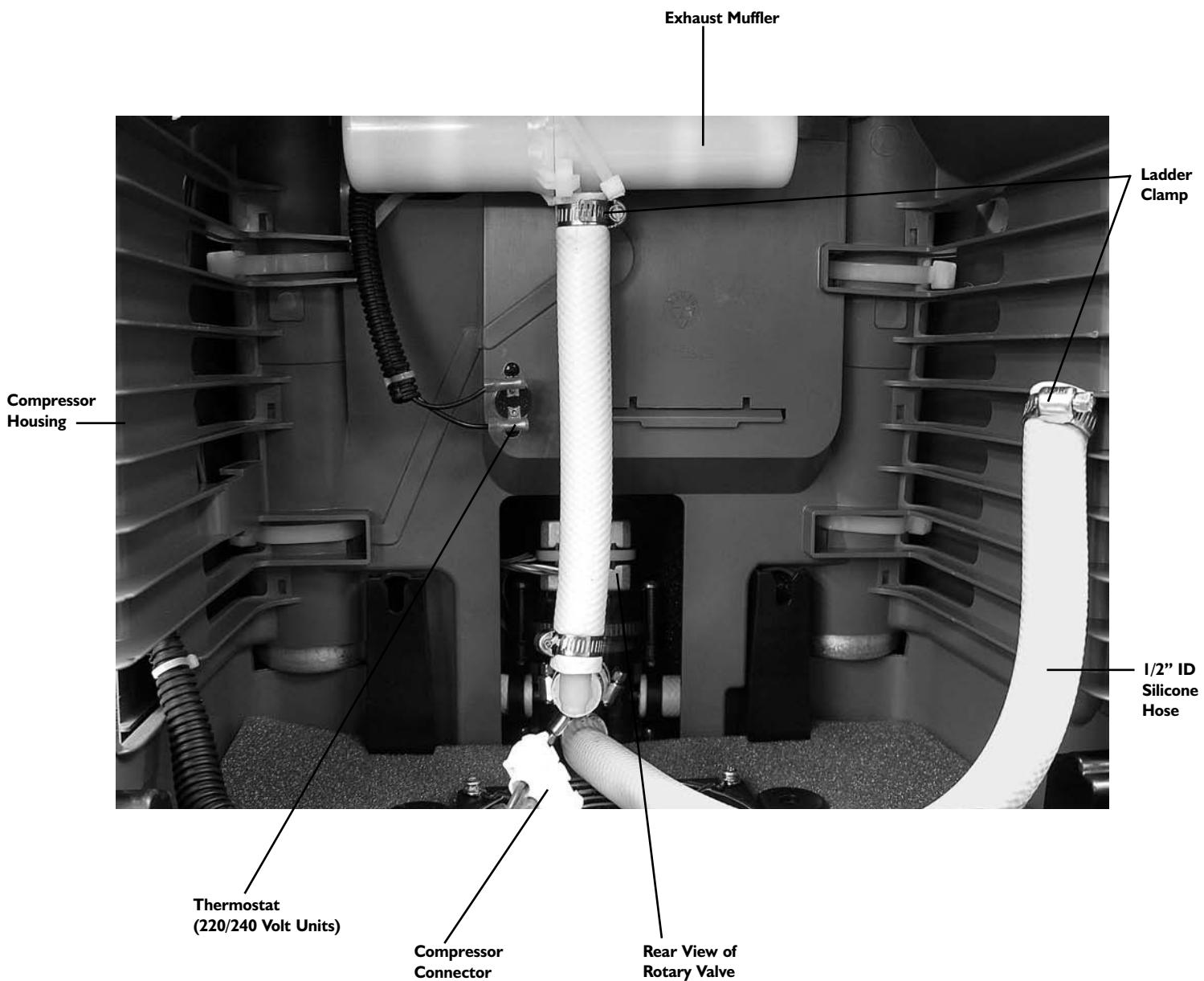
FIGURES, DIAGRAMS, AND VIEWS

Figure 12 - Interior, Rear Lower View



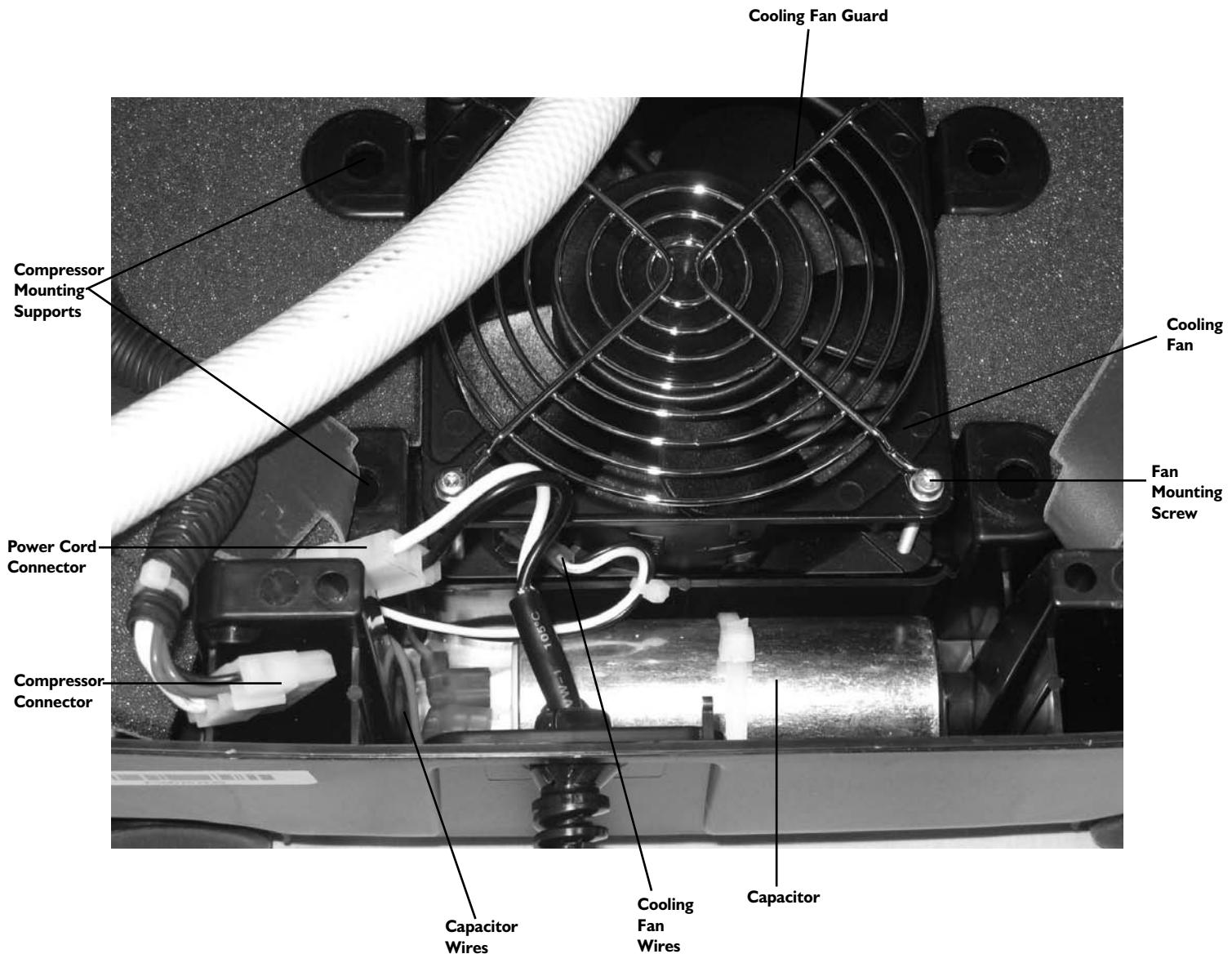
FIGURES, DIAGRAMS, AND VIEWS

Figure 13 - Compressor Housing - Rear View



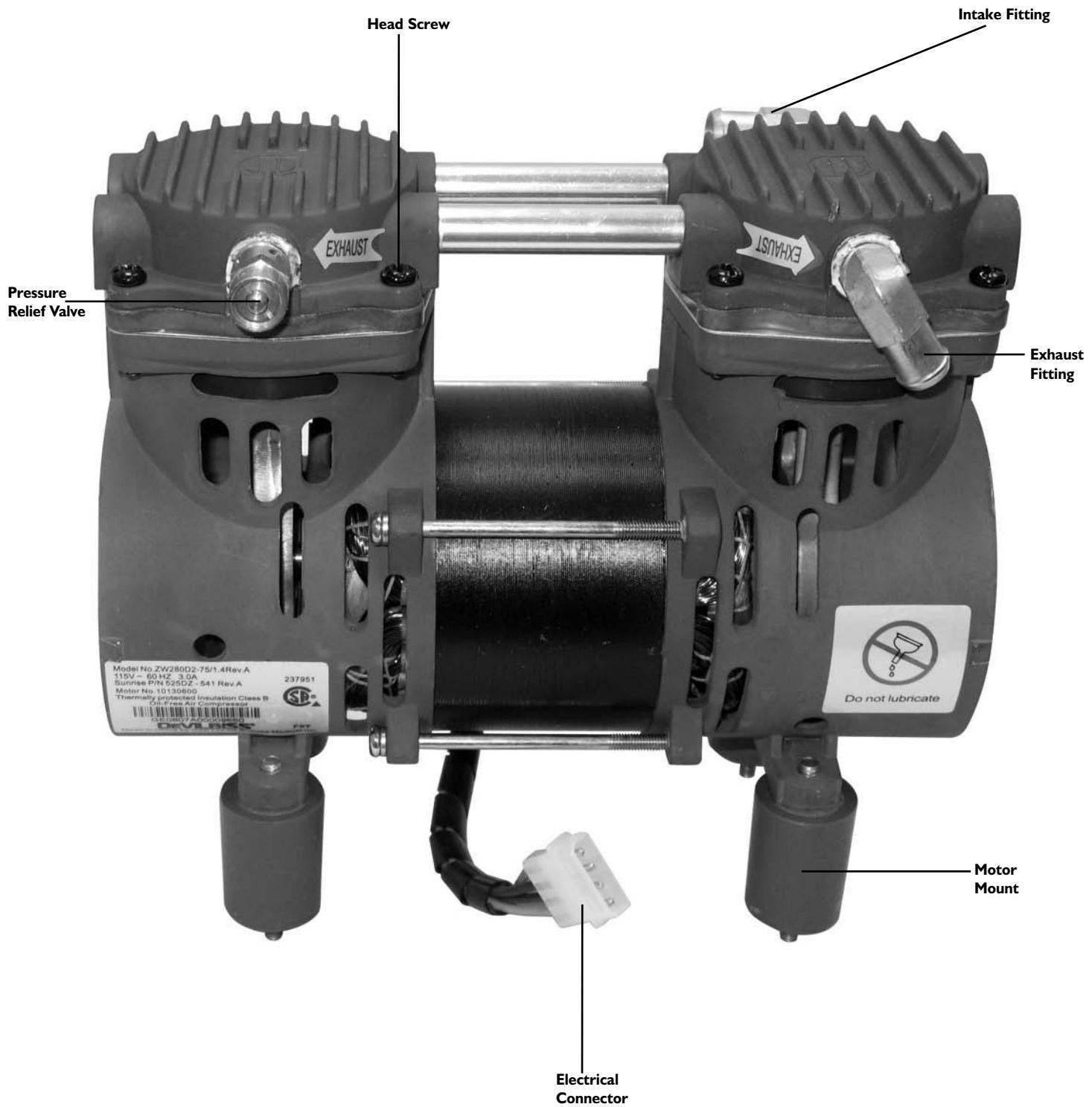
FIGURES, DIAGRAMS, AND VIEWS

Figure 14 - Interior, Base View



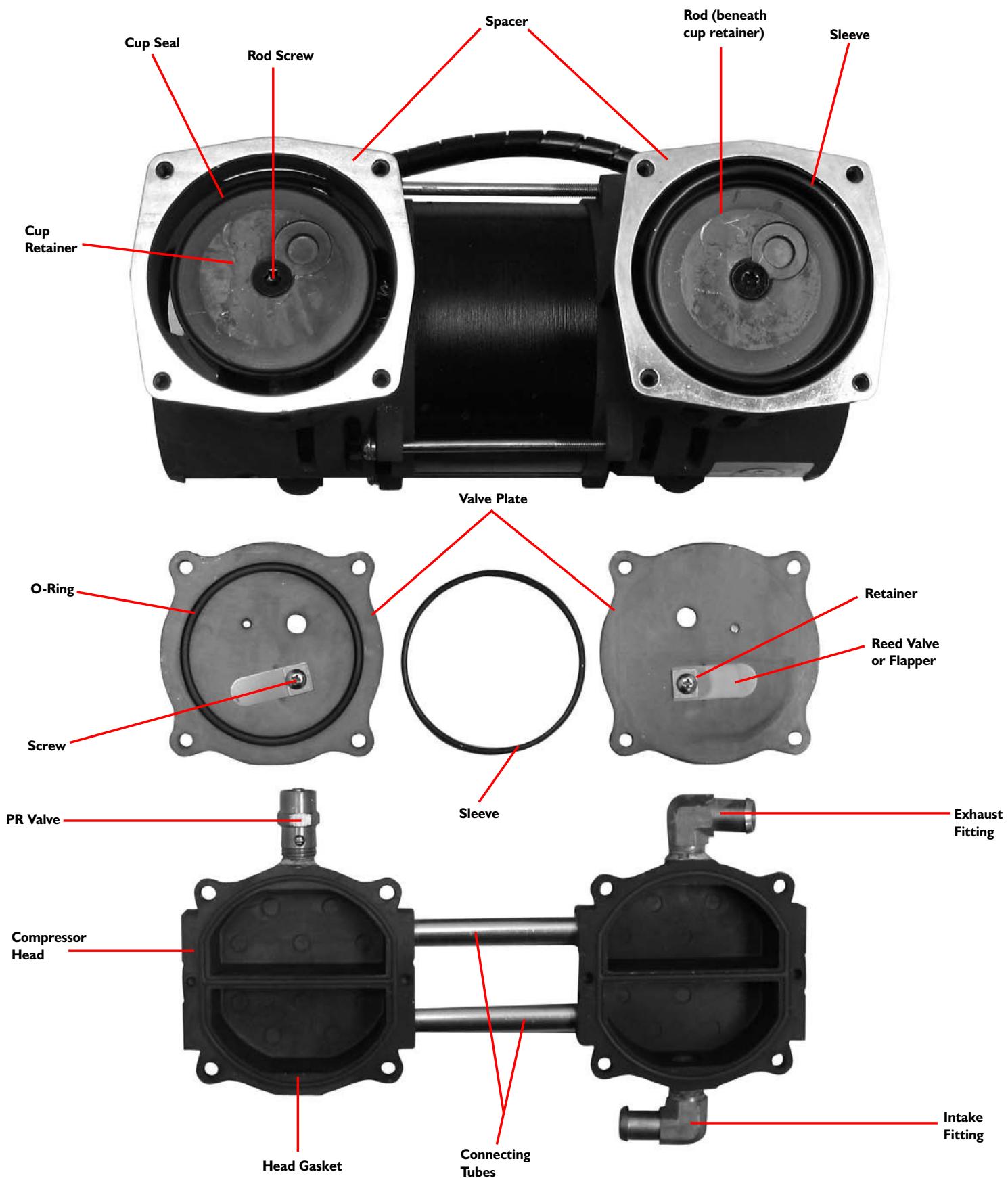
FIGURES, DIAGRAMS, AND VIEWS

Figure 15 - GSE Compressor



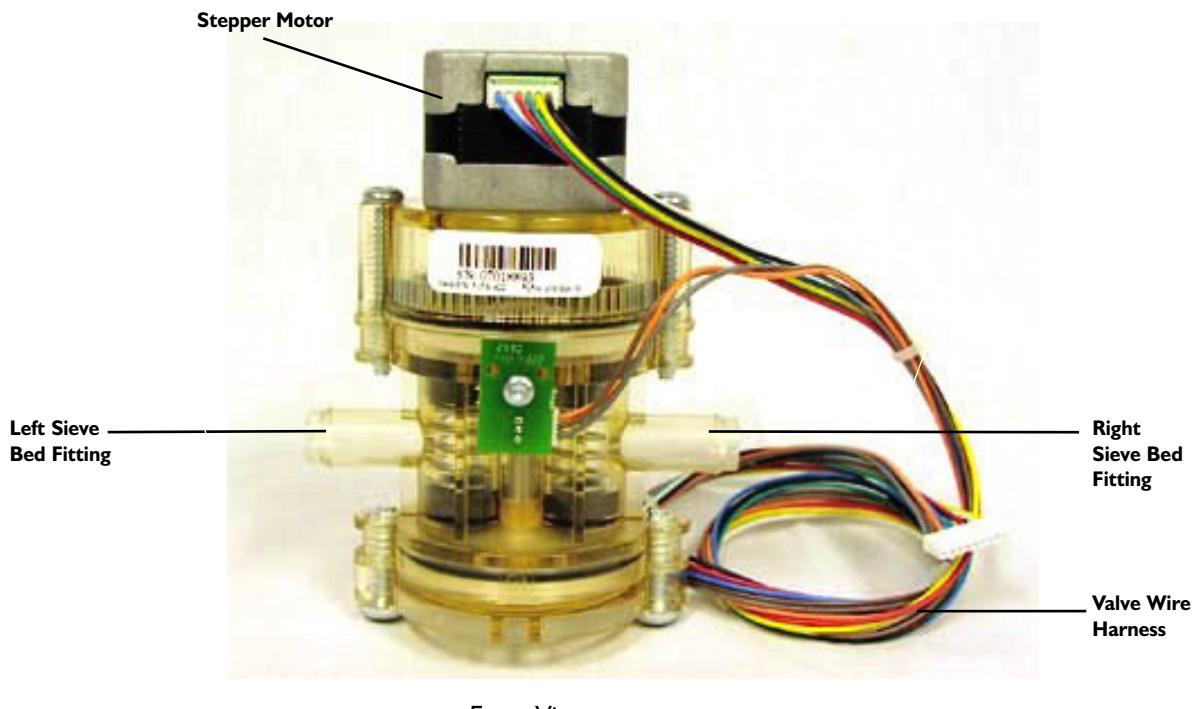
FIGURES, DIAGRAMS, AND VIEWS

Figure 15A - GSE Compressor With Head Removed



FIGURES, DIAGRAMS, AND VIEWS

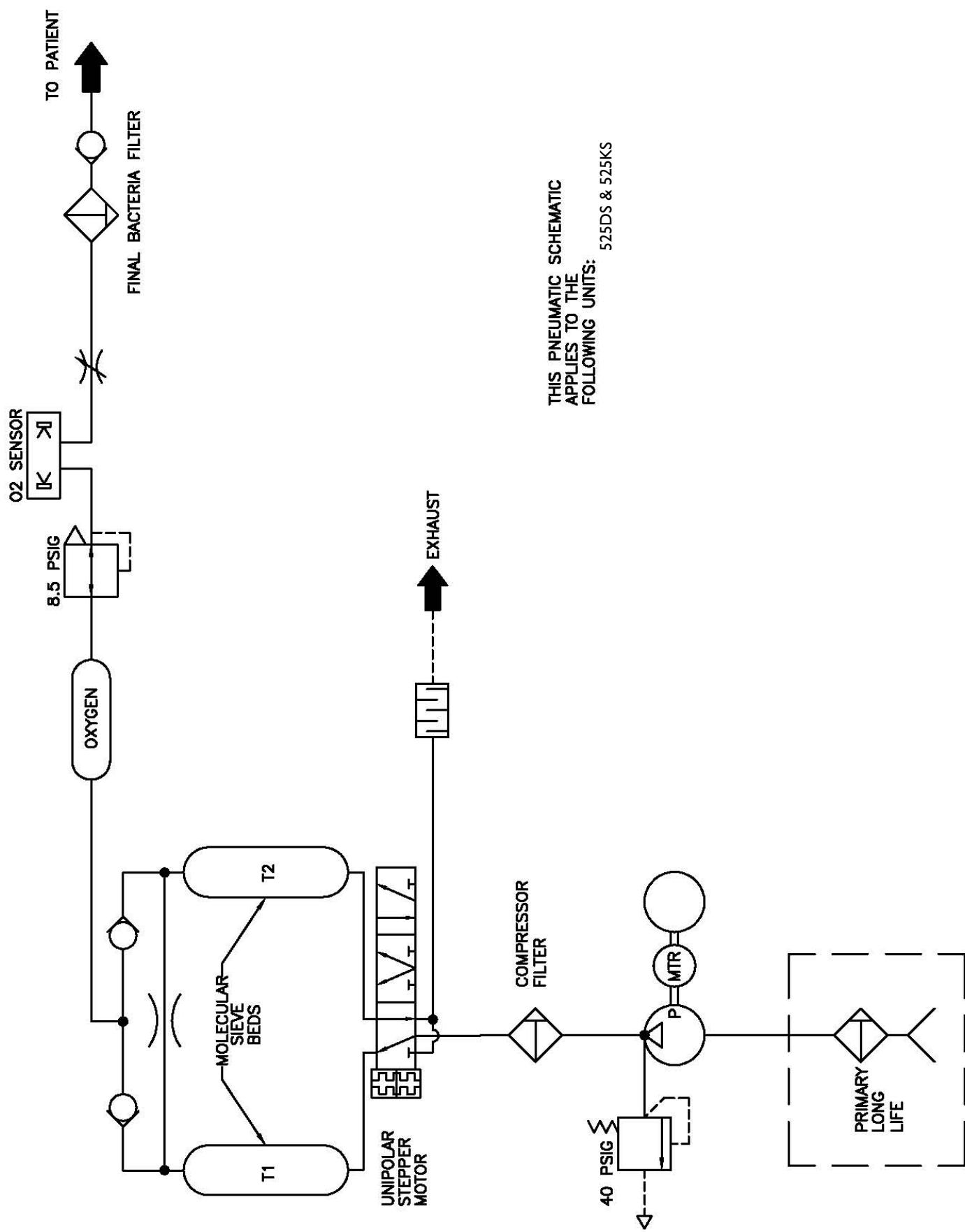
Figure 16 - Rotary Valve



Rear View

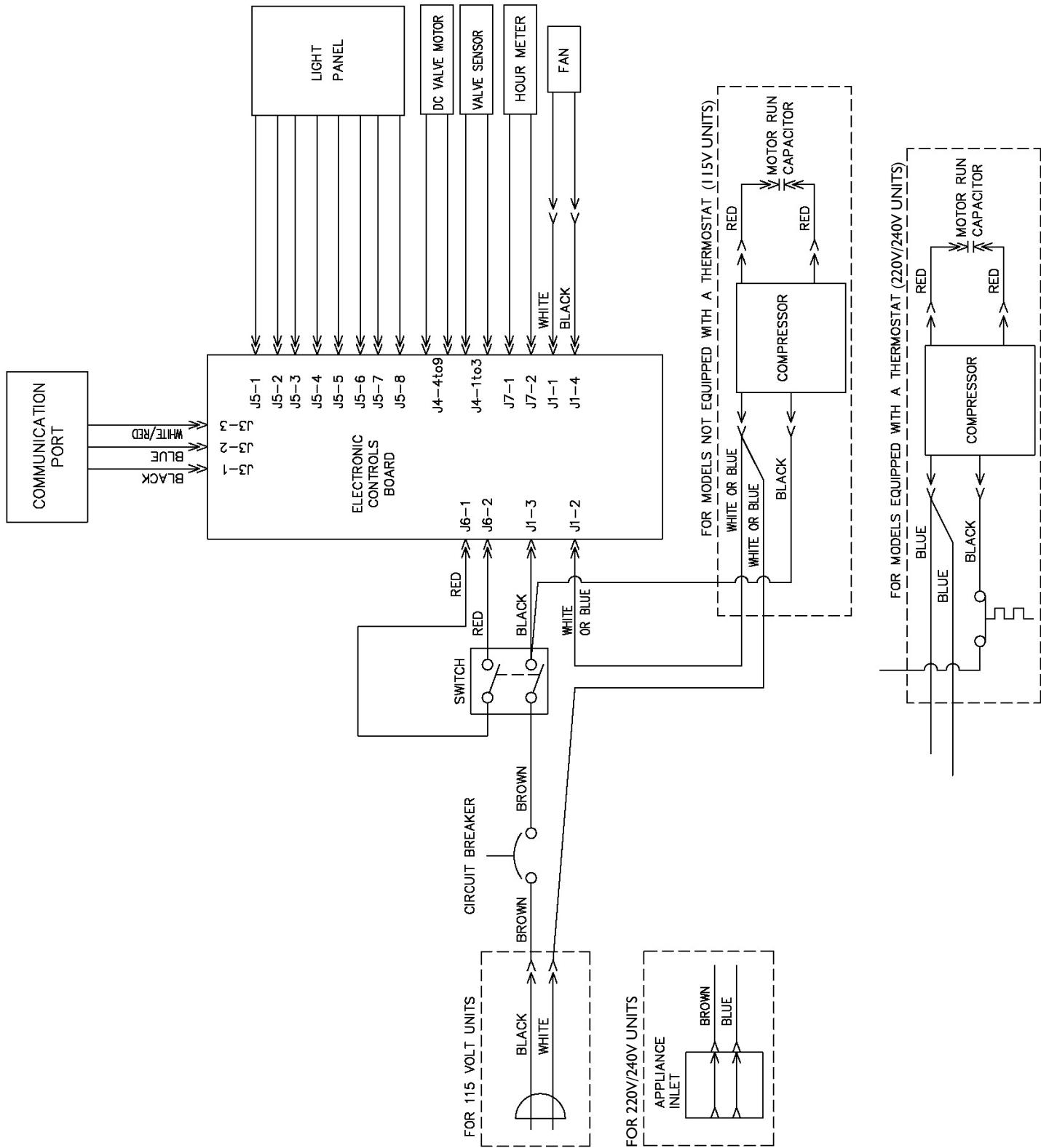
FIGURES, DIAGRAMS, AND VIEWS

Figure 17 - Pneumatic Diagram



FIGURES, DIAGRAMS, AND VIEWS

Figure 18 - Wiring Diagram



DEVILBISS 525DS COMPACT OXYGEN CONCENTRATOR LIMITED WARRANTY

DeVilbiss Healthcare warrants the DeVilbiss 525DS Compact Oxygen Concentrators under the conditions and limitations stated below. DeVilbiss warrants this equipment to be free from defects in workmanship and materials for five (5) years from date of factory shipment to the original purchaser, (typically the healthcare provider). This warranty is limited to the Buyer of new equipment purchased directly from DeVilbiss, or one of its Providers, Distributors, or Agents. DeVilbiss's obligation under this warranty is limited to (1) product repair (parts and labor) at its factory or at an Authorized Service Center or (2) supplying a replacement for component part(s). This warranty does not cover any labor charges incurred in removing or replacing the warranted component part(s) by any other service personnel. Routine maintenance items, such as filters, are not covered under this warranty.

Warranty Claims Submissions

The original purchaser must submit any warranty claim to DeVilbiss or to an Authorized Service Center. Upon verification of the warranty status, instructions will be issued. For component part(s) return(s), the original purchaser shall be responsible to remove the defective component part(s). For all returns, the original purchaser must (1) properly package the unit or parts in a DeVilbiss approved shipping container, (2) properly identify the claim with the Return Authorization Number, and (3) send the shipment freight prepaid. Service under this warranty must be performed by a qualified DeVilbiss provider and/or an Authorized Service Center. Labor costs incurred by a qualified DeVilbiss provider are excluded and will not be reimbursed. Only labor costs incurred by an Authorized Service Center are reimbursed.

NOTE—This warranty does not obligate DeVilbiss to provide a loaner unit during the time that an oxygen concentrator is undergoing repair.

NOTE—Replacement components are warranted for the unexpired portion of the original Limited Warranty.

This warranty shall be voided, and DeVilbiss shall be relieved of any obligation or liability if:

- The equipment is operated or maintained outside the parameters indicated in the DeVilbiss operating and service instructions.
- Unqualified service personnel conduct routine maintenance, servicing, or warranty repairs.
- Unauthorized parts or components (i.e., regenerated sieve material) are used to repair or alter the equipment.
- Unapproved filters are used with the unit.

THERE IS NO OTHER EXPRESS WARRANTY. IMPLIED WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO THE DURATION OF THE EXPRESS LIMITED WARRANTY AND TO THE EXTENT PERMITTED BY LAW. ANY AND ALL IMPLIED WARRANTIES ARE EXCLUDED. THIS IS THE EXCLUSIVE REMEDY AND LIABILITY FOR CONSEQUENTIAL AND INCIDENTAL DAMAGES UNDER ANY AND ALL WARRANTIES ARE EXCLUDED TO THE EXTENT EXCLUSION IS PERMITTED BY LAW. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, OR THE LIMITATION OR EXCLUSION OF CONSEQUENTIAL OR INCIDENTAL DAMAGE, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

NOTE—International warranties may vary.

ORDERING INFORMATION

When ordering components, instruction guides, or service manuals the following must be provided:

- Unit Catalog Number
- Unit Serial Number
- Part Number
- Quantity Required

DeVilbiss Compact Concentrator 5 Liter Series Instruction Guide:

- A-525 525DS English, Spanish, French
- SE-525 525DS & 525KS English, Spanish, French, German, Italian, Dutch, Portuguese

DeVilbiss Compact Concentrator 5 Liter Series Service Manual:

- LT-2023 525DS & 525KS English
- LT-2024 525DS & 525KS Spanish
- LT-2025 525DS & 525KS Portuguese

DeVilbiss Oxygen Concentrator Service Log:

- A-1007 All English

Orders may be placed by calling:

- Customer Service 800-338-1988
- Warranty parts - U.S.A. 800-338-1988
- Canada 905-660-2459 or 800-263-3390
- International Department 814-443-4881

PARTS RETURN AND ORDERING POLICY

ALL DEFECTIVE COMPONENTS THAT ARE STILL UNDER WARRANTY MUST BE RETURNED TO THE FACTORY IN SOMERSET, PA WITHIN 30 DAYS AFTER SHIPMENT OF THE NEW COMPONENTS. IF THE COMPONENTS ARE NOT RECEIVED WITHIN THIS PERIOD, AN INVOICE WILL BE ISSUED TO YOUR ACCOUNT.

REBUILT EXCHANGE PARTS PRICING IS AVAILABLE ONLY WITH THE RETURN OF DEFECTIVE PARTS WITHIN 30 DAYS. COMPONENTS WILL THEN BE BILLED AT THE REBUILT COST; THERE WILL BE A CHARGE FOR SHIPPING. IF THE DEFECTIVE COMPONENT IS NOT RECEIVED WITHIN 30 DAYS, THEN A NEW COMPONENT INVOICE WILL BE ISSUED TO YOUR ACCOUNT. COMPONENTS THAT ARE OUT OF WARRANTY AND NOT ON A REBUILT/EXCHANGE PROGRAM DO NOT HAVE TO BE RETURNED TO THE FACTORY.

Before returning parts or units to the factory, call the DeVilbiss Healthcare Customer Service Department (800-338-1988) or (814-443-4881) to obtain a return authorization number. Include in the package a note indicating the return authorization number along with your company name, address, phone number, and account number. The return authorization number should also be written on the outside of the package.

To expedite your order for warranty or non-warranty parts, the following information should be given to the representative:

- Catalog number
- Serial number
- Hour meter reading for each concentrator
- Account number
- Company name and address
- Description of problem

ORDERING INFORMATION AND PARTS LIST

Accessories		
Bubble Humidifier	HUM16	
Cannula	CAN00	
Cannula w/2.1m (7 ft) tubing	CAN70	
Casters, Locking	525DS-603	
Fitting, Straight Hum. Adapter	444-506	
Low Output Flow Meter	515LF-607	
Oxygen Analyzer	O2ANA	
Oxygen Outlet Connector - Plastic	CN100	
Oxygen Tubing	OST07, OST15, OST25, OST50	
Smart Track	SMART-100	
Smart Track Software	CONCMOD-620	

Tools		
Pressure Test Assembly	303DZ-637	
Pressure Vacuum Gauge	PVO2D-601	
Service Kit	444-501	

Components	525DS	525KS
Accumulator Tank	525D-610	525D-610
Cabinet Parts		
Base Assembly	525D-603	525K-603
Bib	525D-604	525D-604
Communication Port Door	525D-640	525D-640
Compressor Box or Housing	525D-605	525D-605
Filter Door	525D-639	525D-639
Front Cover	525D-601	525D-601
Rear Cover	525D-602	525D-602
Cable Tie, (Sieve Bed)	505DZ-617	505DZ-617
Capacitor, Motor Start/Run	525D-616	MC44I-626
Carton w/ Shipping Inserts	525D-606	525D-606
Caster, Non-Locking	501DZ-603	501DZ-603
Check Valves		
Bed Check Valve	PVO2D-607	PVO2D-607
Final Check Valve	PVO2D-607	PVO2D-607
Circuit Breaker	525D-613	515KZ-615
Cooling Fan	515DZ-634	515UK-634
Cooling Fan Guard	515ADZ-633	515ADZ-633
Compressor	525D-625	525K-625
Compressor Rebuild Kit	525D-643	525K-643
Exhaust Muffler	515A-705	515A-705
Filters		
Cabinet Air Filter	303DZ-605	303DZ-605
Compressor Filter	525D-622	525D-622
Extended Life Intake Filter	MC44D-605	MC44D-605
Final Bacteria Filter	PV5LD-651	PV5LD-651

ORDERING INFORMATION AND PARTS LIST

Components (continued)	525DS	525KS
Fittings		
Accumulator Tank "Tee"	444-582	444-582
Flow Meters		
Standard Flow Meter	505DZ-607	505DZ-607
Low Output Flow Meter	515LF-607	515LF-607
Foam Kit	525D-600	525D-600
Fuse (For PC Board)	515ADZ-627	515AKZ-610
Hoses		
1/8" ID (Blue) (4' Lg)	444-554	444-554
1/4" ID (Blue) (4' Lg)	444-525	444-525
1/2" ID (Braided) (4' Lg)	444-549	444-549
1/2" ID (Silicone) (2' Lg)	505DZ-634	505DZ-634
Hose Clamps		
Plastic (1/4" ID Hose)	444-524	444-524
Plastic (1/2" ID Hoses)	444-538	444-538
Ladder Clamp (1/2" ID Hoses)	444-566	444-566
Hour Meter	PV5LD-617	PV5LD-617
Intake Canister	525D-614	525D-614
Light Panel	525D-615	525D-615
Motor Mounts	505IZ-609	505IZ-609
Nut (Compressor Mounting)	303DZ-630	303DZ-630
Oxygen Outlet Port	303DZ-606	303DZ-606
PC Board	525DS-622	525KS-622
Power Cord	PV5LD-618	VARIOUS
Power Cord Strap	MC29D-657	MC29D-657
Power Cord Strain Relief	505DZ-645	N/A
Power Switch	505DZ-508	505DZ-508
Pressure Regulator	MC29D-612	MC29D-612
Screws		
Cabinet	303DZ-628	303DZ-628
Sieve Bed	525D-619	525D-619
Valve, Rotary	515ADZ-702	515ADZ-702
Wire Harnesses		
Communication Harness	525D-608	525D-608
Main Harness	515DZ-623	515AKS-623
Valve Harness	525D-621	525D-621

S P E C I F I C A T I O N S

DEVILBISS 5-LITER COMPACT CONCENTRATOR

Catalog Number	525DS	525KS
Delivery Rate (Lower delivery rates available for low flow applications)		1 to 5 LPM
Maximum Recommended Flow		5 LPM
Outlet Pressure		8.5 psig (58.6 kPa)
Electrical Rating	115V~, 60 Hz, 3.3 Amp	220-230 V~, 50 Hz, 1.55 Amp 230 V~, 60 Hz, 1.9 Amp
Operating Voltage Range	97-127V~, 60 Hz	187-255 V~, 50 Hz 195-255 V~, 60 Hz
Oxygen Percentage		1-5 LPM = 93% ± 3%
Operating Altitude (tested at 21°C only) 0-1500 M (0-4921 ft)		Across the voltage range: No degradation of performance
1500-4000 M (4921-13123 ft)		Tested at nominal voltage only: No degradation in performance expected.
Operating Environment Range* 5°C to 40°C, humidity range of 10% to 95%		No degradation in performance across the operating voltage range.
Power Consumption	310 Watts Average 275 Watts @ 2.5 LPM & below	230V / 50 Hz - 312 Watts Average 230V / 50 Hz - 296 Watts Average @ 2.5 LPM & below 230V / 60 Hz - 387 Watts Average 230V / 60 Hz - 369 Watts Average @ 2.5 LPM & below
Weight		36 lbs. (16.3 Kilograms)
Sound Level (ISO 8359:1996 from front)		48 dBa overall average (50Hz)
Dimensions		24.5"H x 13.5"W x 12"D (62.2 x 34.2 x 30.4 cm)
Pressure Relief Valve		40 psig ± 5 psig (276 kPa ± 34.5 kPa)
Operating System		Time Cycle / Pressure Swing
The visible "low oxygen" indicator will activate at the following level		84% ± 2% At less than 60%, the red "service required" light will activate.)
Storage Conditions		-40°C to 70°C, humidity range of 10% to 100%, including condensation
Equipment Class and Type	<input type="checkbox"/> Class II Equipment Double Insulated; <input checked="" type="checkbox"/> Type B Applied Part	
Approval Body and Safety Standard	CSA CAN/CSA-C22.2 No. 601.1-M90	TUV EN 60601+A1+A2 ISO8359: 1996
EMC Compliance To:		EN60601-1-2
Typical Accumulator Pressure at Maximum Recommended Flow @ Sea Level @ 750 M (2460 Ft) @ 1500 M (4921 Ft)		22-27 psig (150-190 kPa) 20-25 psig (138-172 kPa) 18-22 psig (120-145 kPa)

***NOTE**—The OSD performance at 5°C to 40°C, 95% R.H. through voltage range on the 525DS verified at 670m.

NOTE—Turn-down mode may cease at 0.5 LPM if a low output flow meter is not being used.

Specifications subject to change without notice

DECLARATION OF CONFORMITY

Manufacturer:	Sunrise Medical dba DeVilbiss Healthcare Respiratory Products Division	Safety Standards Applied:	EN 60601+A1+A2 ISO8359: 1996
Address:	100 DeVilbiss Drive Somerset, PA 15501-2125 USA	EMC Compliance To:	EN 60601-1-2
Product Designation:	Oxygen Concentrator	Authorized Representative:	Sunrise Medical Ltd. Sunrise Business Park High Street Wollaston, West Midlands DY8 4PS ENGLAND
Catalog Number:	525KS		44-138-444-6688
We herewith declare that the above-mentioned product complies with the requirements of EC directive 93/42/EEC and the following:			
Class:	IIa, Rule 2		
Quality System Standards Applied:	ISO13485:2003	CE	0044
Notified body:	TÜV NORD		
MD:	Annex II Applied		



DeVilbiss Healthcare
100 DeVilbiss Drive
Somerset, Pennsylvania 15501 USA
814-443-4881

Sunrise Medical Ltd.
Sunrise Business Park
High Street
Wollaston, West Midlands DY8 4PS
ENGLAND
44-138-444-6688

Sunrise Medical
DeVilbiss Produkte
Kahlbachring 2-4
D-69254 Malsch/Heidelberg
GERMANY
49-7253-980-460

Sunrise Medical Canada, Inc.
237 Romina Drive, Unit 3
Concord, Ontario L4K 4V3 CANADA
905-660-2459

Sunrise Medical
Division Respiratoire
13 Rue de la Painguetterie
37390 Chanceaux / Choisille
FRANCE
33-247-55-44-00

Sunrise Medical Pty. Limited
15 Carrington Road, Unit 7
Castle Hill NSW 2154
AUSTRALIA
61-2-9899-3144